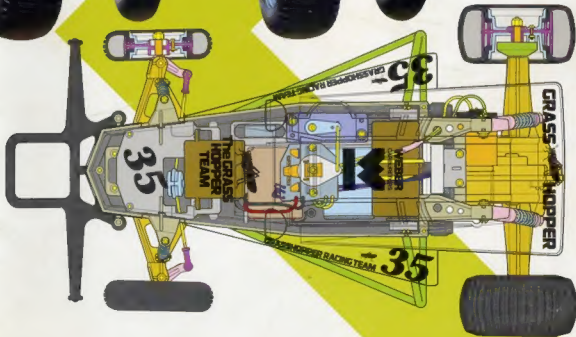
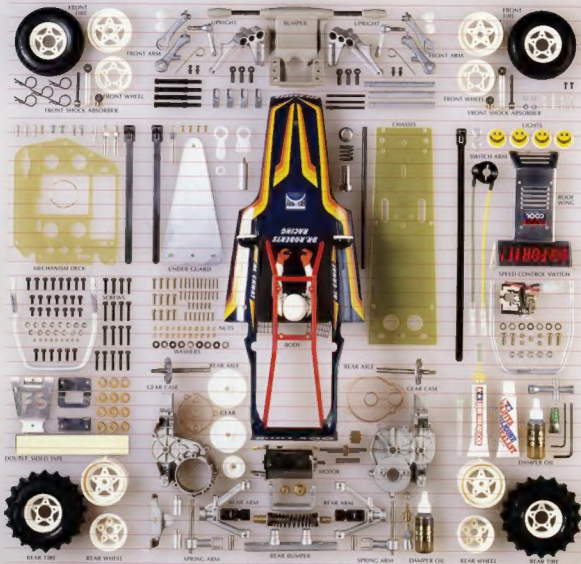


TAMIYA RADIO CONTROL GUIDE BOOK

— modèle —





910 SUPER CHAMP COMPONENTS

In Japan to-day radio control models are enjoying a tremendous boom. This boom has been brought about largely by the lead given by the Tamiya Plastic Model Company. Tamiya has, through its advanced thinking, revolutionised the whole Japanese radio control market. For some time now, Tamiya in its efforts to promote its own items suitable for radio control, has produced a manual to guide the beginner and expert alike. This manual has previously only been available in Japanese language. The English version which we hope you will enjoy, is a literal translation from the Japanese. In some countries outside of Japan, the racing of radio controlled vehicles is already established with rules and regulations already laid down by an organising body. However, the market in Japan to a large extent, has been developed by Tamiya. The development is best judged by the success of Tamiya, who currently proudly claim 80% of the Japanese market. To give you some indication of the boom, Tamiya's first model, the Porsche 904, sold more than 100,000 pieces in Japan alone. We trust you will enjoy reading of some of the ways in which Tamiya has developed this hobby and be encouraged to copy their example.

TAMIYA RADIO CONTROL GUIDE BOOK

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Toys they're not.



ENJOY RADIO CONTROL

A great number of people today are enjoying radio controlled models. They find excitement in the precise mechanism and excellent maneuverability of these models. Some people enjoy customizing to increase their performance and, furthermore, organize races and competition. All of these categories offer limitless enjoyment to the fans. The reliable radio control unit, which was once a very expensive gadget, has come to be within a reasonable price range as the science of electronics has advanced. Also new car and airplane kits are coming on the market one after another in increasingly refined form. The radio controlled electric car models are becoming more popular among not only novices but also skilled modelers because of high performance in spite of their easy handling. Many enthusiasts are attracted by the exciting operation and realistic make up of radio controlled electric tanks, too.

This guide book is compiled to focus on the fundamental knowledge of the radio controlled electric model cars, on hints of assembly and adjustment, on operating technique, and on racing, with our hope that the book can be instructive and help you enjoy the sport as well.

1. RADIO CONTROLLED MODELS

Radio controlled models are nothing but models remotely controlled by radio signals. So most operating models, if they are big enough to mount radio control units, can be converted for radio control. Radio controlled models are classified under kinds of power units; there are ones with gas powered engines, with electric motors, with steam engines, and ones with no power units like sailboats and gliders. There are airplanes, helicopters, gliders, racing cars, buggies, tanks, boats and some others, each of which has many fans.

However, as for the radio control units, most of them in use today are fundamentally the same; they are the digital proportional type, although their capability varies from unit to unit.

2. RADIO CONTROLLED ELECTRIC CAR

The ideal radio control vehicle for a novice modeler to start with is the electric car. And yet, because of their high performance, a number of adept modelers organize races of the electric car in many places. In fact, throughout the world the radio control electric car has the largest number of enthusiasts. As a result, there are many kinds of these models on the market, from large ones of 1/8 in scale to the smaller 1/24. The one most abundant car type and most intensively manufactured by makers is 1/12 scale products.

In the case of 1/8 scale, there are less variety of car styles and races are less frequently held. As for 1/20 and 1/24 scale, many kinds are seen on the market and spare

plastic bodies of the sizes are also available at the market for variety's sake. However, most of them are of toy quality. It is not easy to assemble and adjust full-fledged models of the small size, which are difficult to work on. 1/12 scale cars are most suitable for a modeler whose intention is to enjoy full fledged radio controlled cars and from time to time to participate in official competition. For the present, most radio controlled electric cars are scaled after real racing cars. Some off-the-road buggies in 1/12 scale have been put on the market, and the variety of electric cars seems to be widening all the time.

DIFFERENCE BETWEEN RADIO CONTROLLED MODELS AND TOYS

There are many radio controlled toys sold on the market these days. The characteristic of toy products is inferior in capability to models; for instance, they can turn only in one direction or run very slowly. Of course, some of them are close to the border line between models and toys. A considerable factor is that the toy is always sold in the completed form, while the model is presented in a kit form with components unassembled which are left to you to finish, no matter how little the assembly may be. So the model may be finished in varying levels of performance ability according to the skill of the assembler. Also, they are able to be improved and customized with accessories available on the market. This is another phase of attraction of the model-level products.

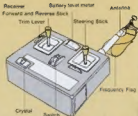
RADIO CONTROL SYSTEM

When you have bought a model, a radio control system designated for the model should be purchased separately which then is to be put into the model, such as an airplane or car.

Most predominant radio control systems on the market today are the digital proportional type. In short, they are called a radio. For radio controlled electric cars and tanks, a two channel digital proportional system is used.

1. MAKEUP AND OPERATION OF DIGITAL PROPORTIONAL

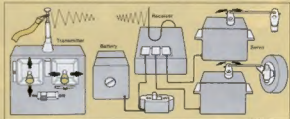
The digital proportional radio control sys-



tem consists of a transmitter which is to be operated by a modeler, and a receiver and servos which are mounted into the model, and power supplies for the units. A transmitter functions as control box, fitted with operating sticks and trim levers for fine adjustment. When the transmitter is in operation, it emits signals by means of radio waves. The signals are accepted by a receiver and sent to servos, which translate the signals into mechanical movements. A servo motor in the servo rotates in either direction at some velocity for some duration of period according to the signals given. The mechanical movements are put out from a servo horn to a model unit to be controlled. Thus, the whole model can be manipulated. The word "proportional" of "digital proportional" indicates that a model is controlled in proportion to the degree that sticks of the transmitter are moved. When you move a stick quickly, the servo motor rotates quickly and the servo horn moves quickly. When the movement of the stick is stopped halfway, the movement of the servo horn will also stop halfway. In other words, you can control a model car at will by manipulating a stick of the transmitter quickly or slowly, to full range of throw or halfway; the movement of the servo horn is hooked up to be transmitted to, for instance, front wheel of the car. This characteristic of movement has made the digital proportional radio control system the principal type in use today.

2. THE NUMBER OF CHANNELS — THE NUMBER OF CONTROL OPERATIONS

The number of channels of the radio control system indicates the number of



operations to be controlled at a time. A four channel digital proportional system will employ four servos to control four different types of action. The radio controlled electric car is basically designed to be controlled in two ways, speed control and steering control, therefore, a two channel radio con-



trol system is to be employed. In the present market, radio control systems are available with up to eight channels. The two channel type, though the most fundamental, is enough to control cars, tanks, boats, and gliders, except gas powered model airplane (which usually require over three channels).

ABOUT RADIO FREQUENCY-STATISTICAL BANDS FOR RADIO CONTROL

Radio waves are used very widely in the society and are very important for medical emergency, police and military, let alone radio and TV broadcasting. If these radio waves should be interfered with, obvious problems could develop. Therefore, specific frequency radio waves for different purposes are regulated to be handled by qualified personnel for the purpose of avoiding disorder. Thus a number of frequency ranges are designated for model radio control, and any other frequency ranges than the allocated ones should not be used under any circumstances.

5. SAFETY, REGULATIONS AND OPERATIONAL BEHAVIOR

Some radio controlled models of airplane, racing cars and boats powered by gas engines can achieve speeds of over 100 km/h. It can cause serious trouble if they should lose control in the midst of operation, it might involve personal injury. Even electric radio controlled cars can attain speeds of 30 km/h. Be sure to abide by the rules stated below and be careful not to endanger or annoy others:

- Do not use the streets for running model cars.
- Do not operate near children or in crowds.
- Avoid radio interference: suspend your transmitter, receiver and models prior to operation.



RADIO INTERFERENCE IS DANGEROUS

Signal waves of radio control systems sometimes reach about 2 kilometers in the air. Models will be interfered with by long frequency bands are the same.



4. FREQUENCY BANDS

This phrase "frequency band" is used to denote the frequencies of radio waves. A receiver of the radio control system will accept signals emitted even from another transmitter, if the frequency used happens to be the same the servos will also be put in motion. In other words, radio control systems on the same frequency will respond to each other, thus causing them to go out of control. However, a number of radio control systems all using different frequency bands can control many models. Hence, it is recommended to employ radio control systems with dispersed frequencies to avoid interfering with each other when organizing a new racing event.

• In radio controlled models, the fixed frequencies are used commonly among cars, airplanes, boats, and any other kind of model. So radio interference will occur so long as the same frequency is used regardless of the difference of types of models. Radio signals from other types of radio control units will interfere with your radio control model.

CHECK UP INTERFERENCE

A device called a "monitor" can be used for detecting radio interference. There is another simple way: get your transmitter away from the model at some distance, and watch responses of your servos. If the servos move strangely, interference can possibly be recognized. While operating your models, if you recognize any sign of interference, stop running and check the cause.

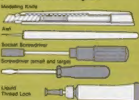


THE BEST POWER SOURCE IS A NICKEL-CADMIUM BATTERY PACK

Nickel cadmium batteries have excellent discharge characteristics. They can discharge a great flow of electricity at a time. This is the reason why nickel cadmium batteries can drive a model car several times faster than dry batteries can. They call for a lot of money when you purchase it at the beginning. They will come to be economical in the long run, since they can be re-charged about 300 times. Because 1/12 radio controlled electric cars are designed to be able to reduce the speed by changing the gear ratio, nickel cadmium batteries can be used for both races with high speed gear combination and for practice running with the low speed gear combination. They are not only economical, but also handy batteries.

NECESSARY TOOLS AND GLUE

Not many tools are required so long as you assemble a kit as is. The necessary tools are illustrated below. Tools especially in need are included in the kit, or at least an explanation about tools is given.



Handy tools if available are side cutting pliers (radio type and ordinary types), screw drivers (big and small), diagonal cutting pliers, filed, vinyl tape, awls, oil, glue, cut-ter liquid threadlock, box drivers for 3 mm or 4 mm nuts.

6. POWER SOURCE

Two different batteries are necessary for the radio controlled electric car: one is for operating the radio control system and the other is for driving the car motor. For the radio control unit, about 12 "AA" (UMJ) size dry batteries are used in most cases and for powering the motor generally batteries of 3 different types can be used.



HOW TO SELECT AN ELECTRIC SOURCE FOR POWERING CARS

Either dry batteries or nickel-cadmium batteries can be used for the power source of radio controlled electric cars. There are two types of nickel-cadmium batteries: one is a package type and the other is an individual type which has the same shape as dry batteries. Dry batteries are cheaper in cost, but not economical since they are thrown away after complete discharge. Also in performance, dry batteries cannot power the car as fast as nickel cadmium batteries do. It is recommended to use nickel cadmium batteries for operating a full fledged radio control model for greater running time.





● GLUE

As for glues, the following three kinds are adequate for assembly: plastic glue, instant glue, and synthetic rubber cement. Some model kits include a tube of glue; on top of that liquid plastic cement at hand is quite useful. Instant glue is used, for example, to fix a semi-pneumatic tire on the wheels, and synthetic rubber cement for a sponge tire to the wheel.

• Be careful when using instant glue, since it has strong adhesion, requiring only a moment to dry. So it is dangerous to have it in the eye or on the skin.

● LIQUID THREADLOCK

Synthetic rubber cement can be used for locking bolts and nuts but "liquid threadlock" works well for keeping bolts and nuts from getting loose.

● OILER

It is a must to oil the gearbox, shaft, and bearing. When oil is insufficient, it causes lowering of performance, and more serious trouble such as seizure of shafts. Spray type oilers are also available on the market today which are very handy for upkeep of radio controlled model cars.

● FINISHING

Any plastic paint can be used. Spray type paints are convenient for finishing larger areas such as bodies. For painting details like coil face features, paints for brush application are available.

● PLA-PLATE, POLYSTYRENE SHEETS, PLASTIC PUTTY

Pla-plate is plastic sheet of the same material as plastic kits. It can be expediently used for creating your own designed wing to the car and for reinforcing bodies and so forth. Putty is handy for mending scratches and small cracks which are often found after re-modeling kits. Several kinds of plastic putty are sold at the market.

ADVICE ON SELECTING KITS

The production of plastic model kits is concentrated on the 1/12 scale line by the manufacturers, consequently the products

of this size are most abundant in variety. When you buy kits, not only kits of 1/12 but also any size, it is recommended to choose a good store. A good store is one which gives you kind servicing, one which carries an ample stock of parts, one which can be a good advisor in building and radio controlling techniques, one which may organize racing and practice gatherings. Generally speaking, a good store means a very reliable retail store which helps you enjoy radio control. Advice from experienced modelers is very helpful, too. It is a sound way of purchasing kits after asking anything you like to know, and studying contents and performance of the kits by yourself until you can be convinced of a sound purchase.

ASSEMBLY KITS AND COMPLETED MODELS

There are assembly kits on the market which you build up parts into a model by yourself and you buy a radio control unit separately and install it into the model, while completed or semi-completed models are available on the market, too. These



completed or semi-completed models may be more economical, since in most cases they are equipped with a radio control unit from the beginning. At the same time they have such limitations as difficulty of disassembling, repairing, or transferring the



radio control units into another model. So assembly kits can be recommended for enjoying radio controlling in a real sense. It is not a hard task to assemble kits, either.

READINESS OF PARTS AND COMPONENTS

Select model, the parts of which are easy to obtain. Tires and gears can wear out; even a speed control switch is an expendable component in a sense. Bodies and chassis may have to be replaced after some collisions. In such a case, your models can be mended easily and economically if the repair and replacing parts are available. For the Tamiya models, such components as a ball bearing gearbox and a more powerful motor are available for improving model performance according to a modeler's controlling skill. Spare parts and components for tuning up are essential to make fun out of radio control to a further extent, so choose a model whose parts and accessories are easy to buy at model stores.

HOW TO SELECT A RADIO CONTROL SYSTEM

The price range of radio control systems on the market is very wide. Any two or more channel proportional type can be used. However, radio control systems sold with small servos may be of low performance for gas powered models. It is recommended to get a radio control system with surplus capability for a modeler who has an intention of handling gas engine models. In any event a thorough checkup and consultation with hobby shops are strongly recommended when you choose one. A two channel proportional unit can control most kinds of models like gas powered cars and boats, sailboats and gliders, except most gas engine powered model airplanes.

HOW TO CHOOSE BODIES

There are two kinds of model car bodies: clear bodies and hard bodies. The clear bodies are made of polyvinyl chloride or polycarbonate, featuring lightness. However, because vacuum-formed from rather simple molds, they are inferior to hard bodies in finish of likeability and detailing, while hard bodies (plastic bodies) offer much more precision scale as they are manufactured by means of injection forming from exquisitely made molds.

POINTS IN PURCHASING

The assembly kit consists of numerous parts and accessories. So it is recommended to check up on the contents of a kit with a store attendant at the purchasing point. Also read through the assembly pamphlet to see how difficult or easy it is and ask questions, if any. Also you might as well inquire about the technical guidance and servicing by the store.

TOP: CIMA / CECILIA LA TARDIA

MIDDLE: PAVO & J. K. LOTUS 76

MID: GERMANY / LEONARD M

TOP: KIM / PAVO



VERSATILITY OF TAMIYA PRODUCTS

HOW BEST TO ENJOY RADIO CONTROLLED CARS

Speed race, gymkhana, drag race, and rally are the ways you can enjoy radio controlled cars. They are roughly classified into two groups by nature of races. In speed races and drag races, a number of cars start at a time to beat each other in time elapsed, and in gymkhana and rally, cars start one by one to compete against time. The Tamiya radio controlled electric cars will produce various speeds according to the kind of batteries employed. With that feature you can

Road course



do a number of different racing events, depending upon the size of area, large or small.

IN LARGE SPACES

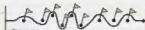
If a large open space is available, enjoy speed racing (heat racing). The road course (winding course like a circuit) and simple oval courses are typical for use. In this kind of competition, the first to complete a certain number of laps is the winner. On the oval course, the lap race is also run, which two cars start at the same time from opposite positions on the course, the one which catches up with the other being the winner. If it is difficult to make a road

Lap race



course for only one car, it is recommended to enjoy high-speed gymkhana. Set a course with obstacles of empty bottles or anything like that. The winner is determined by the time required to complete the course.

IN LONG NARROW SPACES



Slalom race

If the space is long but narrow, you can enjoy drag racing or slalom racing. In the drag race, the object is to cover a long straight way distance as quickly as possible. Since this is a simple race, maintenance of your car to attain high performance is of great importance. It may be fun to make a slope on the course which requires proper choice of gear ratio. The slalom race is an interesting variation of the drag race. Here cars start one by one and race against time through a number of pairs of empty bottles placed in various positions on the course so that they must take a serpentine zigzag path. Tamiya's radio controlled car will need a course only about one meter wide.

IN SMALL SPACES

You can enjoy Tamiya's radio controlled car even in a space only about 2 meters

Technical gymkhana



Gauging gymkhana

square. If the space is limited, it is recommended to race technical gymkhana. Make a course with many curves which need good control techniques. The winner is determined by the lowest time required to run the course. Gauging gymkhana, backing gymkhana, etc., may be a lot of fun, too.

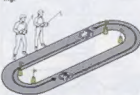
RALLYING

In rally, the car which runs the course in the shortest time to a certain fixed time is the winner. The same timing method as the rally can be employed to determine winners of other games. It is recommended to fix a target time after a few timings of trial runs along the course. Various rules can be established; for example, the penalty system is adopted for a time required over the target time, or in both cases of over or short of the target time. By changing a duration of a target time or conditions of a course, the game may be made more enjoyable.

HOW TO USE RADIO CONTROLLED BUGGIES

An off-road buggy race has a quite ex-

citing fascination, a different pleasure than racing cars. Compete over a dirt course and cross country race to enjoy exciting driving.

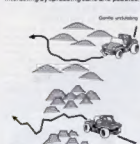


DIRT SPEED RACES

Dirt speed races can be done in flat and vast areas such as a playground or a park. The course can be made in a simple oval course or a more complicated track with hairpin curves and figure "8" curves. You have to be careful since the surface of a dirt course is slippery. Advanced techniques of control are called for, but it is fun.

OBSTACLE RACES

In a place which does not have a very large open space, make an obstacle course. Unlike dents and humps on the ground. Allow a curving course with ups and downs, a car will run in an unexpected direction and it is fun to drive cars on it. You can make it more interesting by spreading sand and pebbles.



Obstacles such as obstacles

DIRT GYMKHANA

In a small place or when there is only one car, make a gymkhana course with empty bottles and drive a car through the pylons. By changing the arrangement of the bottles, a backward course may be made. Compete for time one-on-one.

HILL CLIMB

It is a slope ascending race. Any one which arrives at the top of a mound or a slope is the winner. Or you can contend for ranking by how far you can reach on the up-slope in a fixed time. A decisive factor can be the selection of a high gear or low gear combination, and to take a straight way or a zigzag path.



SPECTACULAR JUMPS

Thrilling jumps are another way of putting on a show with a buggy. Here take-off planks in your course. However, do not make it too high. Build a fairly long straight way before the plank to provide an approach run.

Do not run the model car in the following places:



In a pebbly area or with a very bumpy surface, since the suspension system of the car may be damaged; or in a grass covered field, because grass blades may be caught in the car; also, not in a crowd of people or nearby children.

HOW TO ENJOY RIC TANKS

Tamiya model tanks are powerful enough to force their way over rough terrain and to climb obstacles. They will offer you the widest diversity of enjoyment. You are challenged to create various ways of racing with the Tamiya radio controlled tanks which can be made to move right and left, do gradual and pivot turns and, of course, go forwards and backwards.

ON LEVEL PLACES

The simplest slalom games can be enjoyed. Use empty bottles for pylons and run your tanks in the same way as your radio controlled cars. The first to complete the course is the winner. If a bottle is knocked down, one point is deducted from your marks. You can make the racing more interesting by adding slopes to the course.

IN ROUGH PLACES

It will be more fun for you to race powerful tanks on a rugged surface. Obstacles, such as boulders, steep slopes and trenches, can be made a part of the course. A rule could be made to lose marks when a vehicle goes off course or runs backwards. When a tank stalls on the course during a race, the driver is disqualified. The winner is determined by measuring the time taken to complete the course.

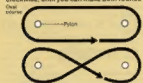
DRIVING TECHNIQUE

HOW TO IMPROVE DRIVING TECHNIQUES

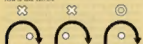
You cannot make yourself a skilled driver just by running a car at will. Make a course using things like empty cans as pylons.

BASIC TRAINING OVAL COURSE 1

This is the simplest course using two cars. It looks simple at first sight to drive a car along, but it will require some practice to achieve sharp and rigid turns made with the pylons as vertices of the curves. Practice both ways, clockwise and counter-clockwise, until you can make both rounds



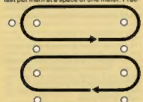
How to take corners



in about the same period of time. Figure 8" drill can also be done in the same track.

OVAL COURSE 2

Have two or three pairs of pylons forming ovals and run your car through them as accurately as possible. You will find it much harder than the oval course No. 1. For the first period of time, arrange the pylons at a wide space, narrow them gradually, then at last put them at a space of one meter. Prac-



tice in both rotations, clockwise and counter-clockwise.

ROAD COURSE

When finishing course No. 1 and No. 2 you have mastered the basic driving techniques. Now you should proceed to complete courses. Build a road course with the pylons, from basic figures "T" and "L" courses to more complicated circuits, assortment of figures "S" and harpin curves, high speed course and slaloms.



WHERE TO LOOK AT WHEN DRIVING

When you drive a car, it is important when you keep your eyes on. Suppose the ovals described are in the field of vision. Put your point of sight on the forward part of the area of vision with a car placed at the rear. The car moves at a rate of 8.3 meters per second when the hourly speed is 30 km/h. With your point of sight on the car itself, you cannot keep clear of obsta-



cles ahead, because it is too late to notice them; nor can you take corners easily.

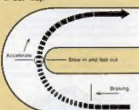
CORNERING TECHNIQUES

No particular skill is required for driving a car just straight, and the drag speed is limited by the car's own inherent performance capability. However, at curves, your fineness of taking corners affects the result even

among cars of the same performance. Especially in speed races, the cornering technique is one of the decisive factors. After becoming accustomed to the car, try to practice smooth, speedy and stable cornerings.

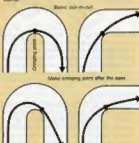
THE BASIC PRINCIPLES OF SLOW-IN AND FAST-OUT

"Slow-In and Fast-Out" is a golden rule in speed controlling at curves. And "Out-In-Out" instructs how to steer a car. Briefly, you should control speed in "Slow-in and Fast-Out" manner and steer a car in "Out-In-Out" way.



WHAT'S "SLOW-IN AND FAST-OUT"?

Decelerating when entering into a curve and picking up the speed after a vertex of the curve is the technique. In the case of entering bends without reducing speed, the car is forced to slow down before finishing corners to lose speed and stability. In the worst cases, the car might spin or run off the course. It also gets the car moving too late to pick up speed. As a result, "Slow-in and Fast-Out" is the fastest way to take corners.



WHAT'S "OUT-IN-OUT"?

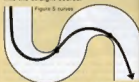
It is, as illustrated above, a way of turning curves from the outside line of a course into the inside line to which the car will come closest at the vertices (crimping points) and finishing the cornering approaching back to the outside line, thus making the longest possible turning radius. By utilizing the full width of the course, the car will make an easier turn than the actual curve

So the car may be allowed to slow through it faster. As a matter of fact, however, it seems more advantageous to sell the crimping point a little after the vertex, because it allows easier later half cornering and enables the car more powerful acceleration into the straight course, in spite of sharper first half cornering.

Both "Slow-In and Fast-Out" and "Out-In-Out" techniques are established from attaching more importance to velocity in the latter half of cornering than the first half. This has something to do with the acceleration of a car; that is, a car increasing speed faster than other cars at the latter half can take the lead in the successive straight track, provided the cars should have the same pickup and maximum speed capability. This principle is true anywhere except in a very wide road where you are not required to reduce the speed at all.

THE LAST CURVE IS THE MOST IMPORTANT IN A CHICANE

The last curve is the most important in continuous curves. In successive bands of a road, steer your car so that it will make the easiest turn at the last curve. Then you will be able to speed it up as soon as getting into the straight course.



CONSIDER COMPLEX CURVES AS ONE

Consider complex curves as one integrated compound. In the case of complex curves with different radii, you can manage to get through by considering them as one complex curve and making a cornering passage.



Curves with a straight in between



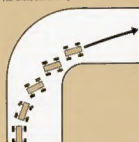
CURVES WITH A STRAIGHT COURSE IN BETWEEN

Even in the case of recurrent curves with straight tracks intervening, you could achieve a smooth cornering by counting them as one integrated curve.

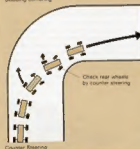
DURING A PRACTICAL RACE, TAKE THE CLOSEST POSITION TO THE INSIDE LINE

Get to the inside lane while still on the straightway prior to the curve. The cornering technique explained is the ideal way when a car is running alone. In actual races, however, when several cars of almost the same capability are competing, naturally other racing techniques have

Four wheels drift cornering



Skidding cornering



Check rear wheels by counter steering

Counter steering

been developed and are used. The most important point is to get the closest position to the inside line of the course ahead of the other competing cars. Here, as illustrated, the passage of car B is sharper than A's and car B will be forced to slow down, but with the advantage of a smaller radius, may be able to get ahead of car A by risking a spinout or being hit from behind by car A. It may block the other oncoming cars. Slower cars should yield the right of way to the faster cars.

OTHER CORNERING TECHNIQUES

As for other cornering techniques, there exists four wheel drifting and tail sliding like real racing cars do. Four wheel drifting is a technique steering a little excessively at the early stage of a curve and letting all the wheels slide outside with the nose heading for the inside line of the course. In this way the car can get through the curve most quickly; however, it is difficult to practice. The tail sliding technique is to make the rear wheels skid while countersteering. This technique is not as stable as compared with the four wheel drifting, and it may not be fast enough to get through the curve, although it looks spectacular.



Steer into the opposite direction of the skid

OPPOSITE LOCK STEERING

The word indicates to steer the wheel against the curve of the turn. If a car should go too fast on a curve, the rear wheels might start to skid, to counter the spin steer into the direction of the skid.



WINNING RACES

After mastering the basic driving technique, apply it to practice. If you have been practicing in the same place, it is recommended that you change the location from time to time. Also, on certain types of surface you will find it very difficult to control the car because it is liable to spin or run off the course. It is also advisable to run your car with others. Then, the track will appear narrower than usual and you no longer have such freedom of movement. Don't hesitate to take part in racing. Accumulated racing experience is very helpful in racing.

1. DRIVING ACCORDING TO RACE TRACK CONDITIONS

There are various track surfaces; asphalt, concrete, wooden boarding, vinyl tiling, etc., and they all have different characteristics. Practice repeatedly so that you can control the car on any kind of surface. Generally speaking, asphalt or concrete tracks are not slippery because they are rough and have a high coefficient of friction. Wood, vinyl-tiled or cement surfaces are smooth and slippery. Note that even asphalt race tracks are slippery when they are wet or covered with fine sand or dust. It is possible to gauge the track condition by eye, but it is very important to confirm the difference of the surface from your usual practice ground by making a trial run.

● Quick acceleration, quick braking and quick steering are taboo on slippery surfaces.

On slippery race tracks, the grip of tyres is very small and the stability of the car is disturbed very easily. Quick acceleration is taboo even at the start, because the rear wheels (driving wheels), whose tyres have little grip, are liable to spin and the car may slide even when it is turned only slightly. Be even more careful in deceleration, if the car is quickly decelerated, the load of the car will move forward by inertia. (In other words, the centre of gravity will move forward), and the load on the front wheels will increase while that on the rear wheels will decrease. Therefore,

the grip of the rear wheels will become much less and they will skid very easily. Deceleration must be made as slowly as possible. Never brake the car quickly when it is running at top speed.

Reduce speed sufficiently before cornering. In cornering, the car is subjected to centrifugal force which pulls it outwards. It is because the centrifugal force is greater than the grip of the tyres that the car is liable to spin or run out of road on slippery surfaces. The centrifugal force increases in proportion to the speed. Therefore, it is necessary to decrease the centrifugal force by reducing the speed and making the turning radius as large as possible. Needless to say, quick acceleration and quick braking are taboo in cornering. Reduce the speed sufficiently before entering the corner, and increase the speed after completing the turn. It is a cardinal rule that the cornering line should be "out-in-out" so as to make the turning radius as large as possible.



2. CHOOSING TIRES ACCORDING TO TRACK CONDITIONS

The tyres have a great influence on the performance of the car. Even when the surface is slippery, it is possible to reduce the chance of skidding by using suitable tyres. Many people use sponge or pneumatic rubber tyres. Use either of them according to the surface.

Sand and dust tend to be held out by the ball bearings.



Grip is lost if water is sandwiched between the tyre and surface. "Aquaplaning".

Effect of sponge tyre

Better grip is obtained because the tyre has better adhesion on a wetter surface.



● Sponge Tyres

Sponge tyres are suitable for asphalt or concrete tracks. They are softer than pneumatic rubber tyres, and adapt themselves better to the track surface. Therefore, on asphalt, etc., with fine grain, they grip firmly. However, on smooth surfaces, such as wood boarding, they are inferior.

● Pneumatic Rubber Tyres

On smooth tracks, such as wooden boarding, the pneumatic rubber tyres may offer better grip. The same applies to wet tracks. On wet surfaces, sponge tyres are liable to slip because they absorb water, although this depends upon how much water is present.

By utilizing the different tyre properties, it is possible to change steering characteristics such as over-steering and under-steering.

3. RACING TECHNIQUE

Even if you believe you are experienced, it is difficult to display your ability to the full in actual racing. When several cars are together, the racecourse appears narrower. Your car is sometimes involved in an accident, and you may often fail to drive your car along the desired cornering line. To achieve good results in racing, it is necessary to acquire good racing tactics and technique.



(1) Points in practice laps

In most races you will be given a chance to practice over the course, but you don't have to run the car very fast. What is important is to make adjustments by means of the trim levers and to gain knowledge of the track.

● Adjustment with trim levers

Practice is the last chance to make any necessary adjustment by running the car. Make sure the car runs straight and the speed control switch can be turned to maximum speed. If necessary, make fine adjustment by means of trim levers. If the switch contains a brake circuit, make sure that the brake works well. In adjusting the straight running of the car, it is recommended to run it directly away from you.

● Knowledge of the race track

Course errors in racing must be avoided. It is important to do practice running along the course at least once. Particularly if you are on this track for the first time, it is

necessary to run the car positively along the course in advance without hindering the progress of races, as well as to attend the drivers' meeting. It is advisable, if possible, to walk along the course in order to remember its intricacies and to note its surroundings.



Adjust the straight running of the car by running it directly away from you.



● Confirming condition of track

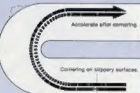
The weather has an important influence upon the surface condition. It is not too much to say that tracks vary according to the weather on the previous day. You should confirm the track condition and decide in advance how to negotiate the main corners. Consider changing the tyres, if you have time, according to the track conditions.

(2) start

The result of a race sometimes depends upon the start. However, a quick start is not always advantageous. Accidents are most liable to occur between the start and the first corner because participating cars are running close to one another. Decide how you should start according to the characteristics of your car, course layout, etc.

● When a quick start is advantageous

If you have confidence in the starting ac-



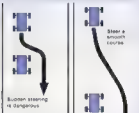
Cornering on track with good adhesion.

corner of your car and you believe it is able to hold its stance. Before the first corner, then, you should choose a quick start. Also, if the distance between the start and the first corner is long, a quick start is advantageous in this case, even if several cars have made a quick start. The distances amongst them gradually increase and therefore there is little possibility of collision on the first corner. A quick start is advantageous as long as the distance of the race is short or when the course layout is intended mainly for speed competition.

When you have tuned your car with a greater emphasis attached to its maximum speed rather than on its acceleration, it should be easy to make up for late way on a straight even if you have made a slow start. In a long distance race, you don't have to be very nervous about the start. Also, if the distance between the start and the first corner is short, it is advisable to make a slow start to avoid collision on the first corner.

How to pass a car

Some drivers prefer to run ahead of their rival rather than behind him, whilst others prefer to be in pursuit. They have their own pace setting in races. The former drivers direct their energies particularly to the first half in order to take the lead from the beginning. Drivers of this type need to employ tactics so as not to be passed by their rival. They should avoid leaving a gap on the inside of a curve where they could be passed. Note that a driver brings his car into contact with any other car on purpose, he may be disqualified from the race. The latter drivers on the other hand make a slow start, pursue their rival steadily and wait for him to



drop out of the race or try to pass him after 3/4 of the type aim at constant performance. They must be able to pass their rival whenever they get a chance. It is a good advice to follow close behind your rival as a car hoping to cause him to commit an error and thereby getting a chance to overtake him. Decide whether to be ahead or behind your rival, and employ suitable tactics.

How to pass a car

Passing on the straight

There are various places in which you can try to pass another car. A straight is the safest place to do so. It is dangerous to start passing a car when you are following close behind it. When you judge it is possible to pass, stop your car a little as soon as possible and attempt to pass. You may pass on either side, wherever there is more room. If the space on each side is about the same, it is advisable to go inside the make the next corner easier to negotiate.

Passing on a corner

Passing on a corner is dangerous as compared with passing on a straight. If the driver of the car you are going to pass is not skilful, a control your car is liable to be involved in its spinning. To make passing easier, it is advisable to go inside the rival's car and pass it after turning the corner. It is very difficult to pass it on the outside of the corner even if your car is much faster. If your car has hit another car and lost its stability, then reduce the speed by turning off the speed control switch. If you try to restore stability by steering, the car must be further disturbed. Start acceleration again only after the car has slowed down and is stable.

How to pass a car on a corner

Unlucky accident

It is impossible to foresee what accidents or trouble will occur in your race. If you damage your car in the first heat by overtaxing it, perhaps you may not be able to achieve a good result in the Steady running. It is the key to success. Use the first heat to verify that your car is handling correctly and running smoothly and, just endeavour to complete the race. Never overtax the car. If it fails to finish, there is little possibility of being allowed to run in the final.

If you run the first heat steadily, you can try your best in the second heat. To obtain a better result than in the first heat, use all your skill and employ more advanced cornering techniques. If you did not obtain a satisfactory result in the first heat, you may stake your all on the second heat, but you must not drive recklessly. You should refrain as far as possible from using tactics that might cause an accident.

Being able to take part in the final race is a ready means that you are a qualified driver. Show ability to the full in the final race. From the results in the first and second heats, you can guess your rank among the finalists. If your ranking seems low, endeavour to raise it, even a little without aiming at victory. If you seem to rank high among the finalists, you should try to win. As you are capable of winning or at least a good place, be careful not to be involved in a stupid accident. Always do your best.



DRIVING IN RAIN

It is recommended to refrain from running your car in rain because the radio control mechanism is liable to be affected by water. However races may be held in drizzle. It is necessary to have some basic knowledge of driving in the rain.



1. DRIVING TECHNIQUE IN RAIN

Any wet race track is very slippery. No cars may spin even when they accelerate at the start. Read the description of driving on slippery surfaces on page 8 and drive your car accordingly. Quick acceleration, quick deceleration and sudden steering are taboo. In cornering keep the steering angle of the front wheels as little as possible so that the turning radius is large. When there are puddles on the race course, avoid them even if your car has to make a detour. If you attempt to drive through deep water, the radio control gear may get wet and your car will be slowed by the resistance of water. Furthermore, your car may skid out of control.

2. WATERPROOFING

The radio control mechanism, particularly the receiver and servos, contains precision electronic circuits carrying weak electric currents for control. If water enters the mechanism, it may cause a short circuit which often causes damage to an electric circuit and makes it impossible to control the car. If a wet electric circuit is kept electrified, its fine wiring begins to corrode gradually by chemical reaction and may be broken even by a slight shock some time later. Such a circuit may be come unusable. Therefore the radio control mechanism must be made waterproof. If the weather forecast says it will rain on the day of racing, it is necessary to make the radio control mechanism waterproof in advance.

Waterproofing of car body

It is not easy for the radio control mechanism to get wet directly by raindrops because it is contained in the car body. Pay attention to water splashed by the front and rear wheels and water entering the car body through the chassis. Coverings in the chassis, such as holes bored to reduce weight, should be stopped up with vinyl tape or similar. Another means for pre-

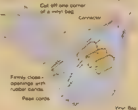
venting spray from entering the car body is to fix screens of toughened polystyrene sheet or aluminium plate to the chassis parts just in front of, behind, and inside each wheel to deflect the spray.

Waterproofing of radio control mechanism, etc.

The receiver in the radio control mechanism is most likely to be affected by water. To make it waterproof, wrap it in a



vinyl bag, the mouth of which is firmly closed by means of a rubber band as shown in the illustration. It is advisable to apply vinyl tape or similar to the joints of connectors and casing. It is difficult to put servos into vinyl bags because they have moving parts. However, at least their lead wire holes should be filled with synthetic rubber adhesive. The waterproof



ing of the connectors for the radio control mechanism and traction motor is also important. Put the connectors into a vinyl bag and close it by means of rubber bands. Previously, the switch for the receiver/servos often became faulty because of short circuits, etc., caused by water. Nowadays, it is almost free of such troubles. But, it is advisable to move it to a position which is less liable to become wet and to apply synthetic rubber adhesive to its lead wire holes. Tamiya Oil Spray will help to waterproof the speed control switch, electric motor, etc. Also the battery is liable to be affected by water and should also be put into a vinyl bag.

NOTE: Page 58 describes the method of using the Tamiya waterproof rubber bags for more



permanent protection. Vinyl bags, though cheap and readily available, are prone to tear easily and will not offer permanent protection such as the Tamiya rubber bags will.

3. MAINTENANCE AFTER RACING

On a rainy day the car gets very wet and dirty and it is almost impossible to prevent water from entering the car. If it is left as it is, the chassis, etc., may rust and the radio control mechanism may develop unexpected trouble. After using the car in rain, be sure to carry out maintenance as soon as possible.

Maintenance of car body and chassis

Wipe water off carefully with a soft cloth. The chassis in particular should be taken apart: the axles should be removed and thoroughly dried. Oil shew all moving parts because their oil has probably been washed away by water. Adhesive fitting of the servos, etc., may have been weakened by water. It is recommended to refit them with new adhesive. Tamiya Oil Spray gets under water and protects metal surfaces. Use it freely on moving parts.

Maintenance of radio control mechanism, etc.

Remove all the connectors and wipe off water from the whole mechanism. Then, remove it from the car and dry it in an airy place in the shade. If the receiver is wet inside, remove the casing, wipe off water and dry in the shade. (The receiver must be handled with care.) If the receiver is wet inside with muddy water or salt water, carefully rinse it with clean water. After it has dried completely carry out a perform-



ance test. If it does not work, have it serviced by the manufacturer or his agent. As for the electric motor and speed control switch, it is recommended to apply Oil Spray or similar after carefully washing off all water. Also dry the battery thoroughly. The RC mechanism contains precision electric circuits. Do not attempt to take it apart.

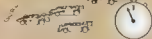


Today the radio controlled electric car races are often held in many places promoted by manufacturers and hobby stores. Participate in the official competition when you get used to operating model cars to some extent. If you attain a good score you will gain confidence. Even with poor grades you will see better modelers operating a car which is most likely of better performance and helps you to improve your own control technique and your model. You will also find a different kind of delight other than playing with models among just your friends.

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Schedule of races may be announced at the hobby stores or in the magazines. It is mandatory to enroll yourself in the contest.

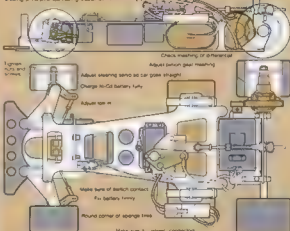
Schedule of races may be announced at the hobby stores or in the magazines. It is mandatory to enroll yourself in the contest.



roster. In most cases you cannot apply to an event on the very day. You are required to give the class and kind of your car and frequency you will use. Besides your name and address.

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Rules of racing events usually tell you how the race proceeds: How to determine the winners, how to group the models, kinds of motors and batteries to use. Sometimes detailed regulations are provided to regulate the standard equipment of racing cars. Confirm these rules and regulations beforehand with your car, and remodel or modify if necessary for compliance in official competition; car inspection will be done at the registration area on the day to see whether or not your car is qualified. Of course, a disqualified model is rejected. So, please understand it that in any points you don't understand in the rules and regulations, you should check with the host or qah2010@pcn.

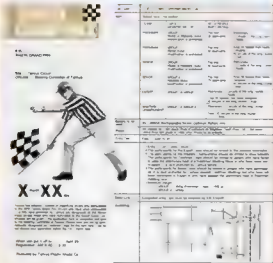
Get your car ready for the race by the previous day. The most important is the radio

Get your car ready for the race by the previous day. The most important is the radio

control system, since you are required to place the transmitter in custody of the host organization. Namely, you cannot tune it up on the competition site after registration. On top of that, gear meshing, screws or bolts and nuts, shaft and tires should be carefully looked after, repair or replace with new parts if necessary. Of course, oil all the rotating parts. If you find batteries are low on power, replace them or charge them fully. 1 rechargeable.

It is needless to say to take a registration card or membership card with you if anything is that is required. Be sure to bring tools, glue and oil which you use every day. Sometimes you have to mend your car even in the midst of competition. Do not forget to bring fragile parts and accessories which are easy to lose such as screws and bolts. It is advisable in regards to the length of time of the event that spare batteries may be recommended to have for caution's sake.

Leave your home for the race site with ample time for arriving early for registration. Your delay for the registration may upset the whole schedule and annoy others. Very often registration and car check are conducted at the same spot. Undergo the registration desk, you may be given a contest number, perhaps marked on a pennant. During the whole event, you may be referred to with that number when being called or receiving your transmitter, so remember this number. Car check may be done after the registration. Your car will be examined



12

The above two methods are good ways to form groups. There can be a beginner and an advanced class. If sorting is carefully done. Top ranking contestants in the beginner's class can be placed in the advanced class in the next race.

6. GROUPING OF MODELS

- By batteries
- By motors

Basically there are these two classes. You could classify by types of cars or vehicles or by scale, but grouping by battery type of motor type is probably more satisfactory because the demands of different types of track will alter the battery or motor requirement. On a straight course where cars or race at their maximum speed, there can be a wide difference in rpm, I between cars with dry cells and cars with nickel cadmium batteries, or amongst cars with nickel cadmium batteries of different voltage. On a track where a lot of corner is called for deceleration, it is imperative to have separate classes for cars with RS-360 motors and 1 but fast running, and those equipped with the big and powerful RS-540 motors.

- Modified car class

As a modeller enriches his experience through numerous races and grows familiar with radio control, he is urged to modify and increase the performance of his car. Increasing performance may be endlessly sought after. However, considering the cost of modifications and the finesse required, only a few people may be able to achieve this. It is practical to organize a class of modified cars with some limits set to the amount of remodeling allowed, so that those who do not have the technical knowledge or the necessary finances to carry out major modifications, may participate in the race.

7. CONSTRUCTION OF COURSES

- SPEED COURSE
- TECHNICAL COURSE

A speed course has a rather long straight away where it is easy to pick up speed. Performance of a car is a key factor to win or lose a race. So with a speed course a distinction of cars driven by dry battery from nickel cadmium ones and remodeled cars are necessary. A technical course consists of a lot of curves and the driving technique is more important than capability of a car. With the course, therefore, sorting of classes by car types is not necessarily required. Since the Tamaya cars can go backward, it might be interesting to adopt parking and reverse going courses.

8. REGISTRATION ON THE DAY

- CAR CHECK
- IMPOUNDMENT OF TRANSMITTERS

Ascertain who the participants are with the entry form. Check if the car is qualified under the requirements of the particular race class. At the registration desk, impound the Transmitters of all the contestants. Of course, return them to assigned

races just before the races begin. As soon as the race is over, the transmitters should be impounded again. In other words, all the transmitters of the contestant are to be under custody of the host organization all the time during the event, except for those which are being used for a race. This is done at dry radio control racing gathering for the purpose of preventing interference. The transmitters in custody had better have attached a contest number and be kept in a grouping of frequencies.

9. RACE

- RADIO FREQUENCY CONTROL
- RACE ADMINISTRATION

In a radio controlled car race, cars using the same frequency cannot compete at a time. Reversely speaking, only as many cars as there are different frequencies can race simultaneously. However, to avoid interference, cars with every other frequency should be arranged to compete

1	2	3	4	5	6
1	100	100	100	100	100
2	100	100	100	100	100
3	100	100	100	100	100
4	100	100	100	100	100
5	100	100	100	100	100
6	100	100	100	100	100
A	100	100	100	100	100
B	100	100	100	100	100

1st heat (6 races)

1	2	3	4	5	6
1	100	100	100	100	100
2	100	100	100	100	100
3	100	100	100	100	100
4	100	100	100	100	100
5	100	100	100	100	100
6	100	100	100	100	100
A	100	100	100	100	100
B	100	100	100	100	100

2nd heat (6 races)

1	2	3	4	5	6
1	100	100	100	100	100
2	100	100	100	100	100
3	100	100	100	100	100
4	100	100	100	100	100
5	100	100	100	100	100
6	100	100	100	100	100
A	100	100	100	100	100
B	100	100	100	100	100

When there are eight contestants, a race is formed with four people to participate making two races. Races are done repeatedly for each combination (each race class, heat or round). Points of each heat are to be summed up to determine the final ranking.

This is a full-scale track for motorized RC model cars only. The surface is asphalt paved. The outside course is approximately 100 meters long, and combines with inner tracks to provide more than ten different



types of course with a maximum length of 140 meters. The outer track is 4 meters wide and the inside tracks are 3 meters wide with a variety of hazards including a 180° hairpin bend and 'S' shaped turns. Also, the entire circuit has a height differential of about 25 cms. So this circuit requires precise control and much skill. It is indeed worthy of challenge!

The Tamaya Circuit is available for use, completely free of charge, for racing events sponsored by Hobby Shops etc. and it is open to the public without payment on Saturday and Sunday of each month. For further particulars, please write to the "Circuit Section, Trade Department at Tamaya".

Tamaya Plastic Model Co.,
628 Oshika, Shizuoka City Japan, 422.



● KINDS OF RACES

POINT SYSTEM RACE TIME RACE ROUND RACE

These three are typical kinds of races. And it is common through these three that the combination of the members should be changed so that any participant has an opportunity to compete with as many other contestants as possible.

● POINT SYSTEM RACE

Points are given to each heat. The points are totaled to decide the ranking.

- Depending upon combination of entrants to a heat, sometimes only 2 or 3 people can compete. Even in such a case, the points of the first place are awarded.
- When the total points of all the heats to the score a playoff will be held. When contestants using the same frequency should not draw the winner is chosen by comparing the rankings of each heat or else they are made to vie for superiority by running one by one for time.

● TIME RACE

Time required at each heat is recorded, and the ranking is determined by the total time. Sometimes the point system is used together with time to get the result more distinctly.

● LAP RACE

One who makes the most number of laps on the course in a given time is the winner. This method is often employed for long distance endurance contests. A notable common feature through point system, time and round races is that entrants have to be classified under a frequency to use. Because participants using the same frequency will be never contend at the same time under any circumstances, the final ranking is not necessary reflected with their reality of controlling models. This is something which cannot be helped so long as the frequencies are restricted to a limited number. However, the problem can be solved to some extent by arranging races in a series form or absorbed with the time race system.

10 PENALTY POINTS

A participant should be penalized when he conducts himself against the spirit of fair play or against the smooth progress of a contest. The punishment is disqualification and then imposition of a cut in marks or additional penalty time.

- It is usual that interference to other cars and remodelling exceeding the limit should be liable to disqualification.

- A breakaway is subject to demerit mark. The penalty system should be constituted from the standard of annoyance to other participants or injustice among the entrants.

11 TROUBLE

When a model gets out of order in the midst of a race and is unable to proceed or

out of control, all cars in the race should start again or the car alone should be retired.

● RESTARTING

In case the cars go out of control by radio interference or the race is obstructed by spectators or somebody else, restarting will be done.

● RETIREMENT

In case a model cannot proceed in the race due to insufficient previous check up or because of an accident while racing, the said car only must retire from the race.

12 ACCOMMODATION

Ample consideration is desired to be given to conveniences and accommodations in the place of the meet, in order to produce an exciting atmosphere to the race.

● START FLAG

Generally a national flag or a flag of the host organization is in use.

● FINISH FLAG (CHECKER FLAG)

A checker flag of black and white is waved to the winner's car just before and when crossing the finish line.

● SCORE BOARD

To help the race proceed easily, a score board is desirable to be installed for announcing the records of each heat and ranking to the public.

● CONTROL STAND

A stand is very convenient to install so that the racers can command the better view of the course and the cars while racing.

● PROPS IN THE COURSE LAYOUT

A bridge made of a tire or advertisement sign boards of companies which can be seen along a real racing track and miniature guard rails used as pylons in the course will enliven the race.



THE CHALLENGE OF LE MAN

LONG DISTANCE AND ENDURANCE RACES

The Le Mans 24 hour race is one of the most important sports, and the famous Spa-Francorchamps 24 hour race is one of the most important type cars. A combination of driving ability and teamwork of the pit crew is necessary for winning this type of race. Fuel (batteries), tire changes and the correction or replacement of broken parts are essential from the pit crew in the minimum time possible to remain competitive. A pit stop period of race should be conducted over a period of at least one hour, and the winner is the vehicle that completes the most laps during the period. Recharging batteries, assembling required spares and changes in the steering and gear ratios are only some of the things that might need to be accomplished during the race. Driver fatigue can also be an important consideration during the race, and changes of drivers should be anticipated during a pit stop. The fastest car on the course is not necessarily going to be the winner. The car that maintains the best total average over the entire race is most likely going to win. Prior race planning and your vehicle, as well as battery duration and speeds over the pit can give you the edge for winning long distance races. The challenges of long distance racing are completely different from those of sprint races.



THE TORTOISE AND THE HARE

About "Speed" in long distance racing

In any long distance race, you cannot say for certain that the fastest vehicle is going to be the winner. We are all familiar with the sage of the Tortoise and the Hare. The Tortoise was slower than the rabbit, but won the race by keeping a steady pace throughout the course. Maximum acceleration and high top speed are not that necessary in long distance racing. If you have a very high performance car "tuned up to its capacity" and attempt to run a long distance race, you are likely to spin out often if you are initially concerned with leading the pack at the races outset. Fast acceleration

tion and a high top speed utilize a large current flow from the battery thereby reducing the pit stop for battery changes. Long distance vehicles also require a greater degree of precision tuning, better maintenance, and durable parts and perhaps a different gear ratio. The vehicle that makes the fewest pit stops will most likely be the winner.

CARS FOR LONG DISTANCE RACES

Credibility & durability are the first requirement

In full sized car racing, the machine used for long distance racing has less high speed performance than a racer for sprints. This is due to the fact that the vehicle will last the entire race, and not become disabled prior to the finish. In radio controlled cars, for long distance racing, the same is true. A car made from a pit properly will have this durability and be competitive during the entire race, however if it is not built and assembled accurately, the chances of it surviving a race is slim. You must make sure that all screws and nuts are tightened firmly and where required, that liquid thread lock is applied to the threads to prevent loosening. It is recommended that all electrical wire splices be soldered, to ensure a good positive electrical contact throughout the race, and that the wiring is tied down firmly to prevent it from becoming entangled in drive gears etc. Prior to the race, use new rubber bands and replace the doubled soaked sarto tape with fresh tape. That car that is lighter in weight will move faster, however, the heavier the chassis by drilling holes in it, or removing some bracing, you may find you are faster, but the car will not last the race because it is no longer durable. Credibility & Durability are the keys to winning long distance

Pit practice and maintenance for victory

The majority of pit work during the race will be battery changes. By saving time during these stops, you can greatly advance your standing in the race. It is very necessary that your crew practice removing the body change batteries, replace the body and secure it on the chassis. The more this is practiced, the quicker they will be during the race. One second saved in time is a gain of one second on the leader and races are won and lost in less time than a second. During the race it is necessary to be calm during pit stops. If you are in too much of a hurry you could make mistakes that delay getting back into the race such as misplacing clippings for the body, failure to connect up the battery properly. Practice, and more practice is the key in saving time. Also be prepared to replace motors, wheels and tires during the race. If you use plug type connectors to the motor it can be replaced quickly if necessary. The same is true of the speed controller. Make it easy for your pit crew to keep the car on the track.

A powerful motor is not always profitable

A large, powerful motor is a necessity in sprint type races where no battery changes are needed; however the same does not hold true for long distance racing. Smaller motors which use the electric current are much better as they require fewer pit stops for battery changes. As an example, the Mabuchi RS-5405 and RS-3808 motors are representative of motors used in radio control racing. The RS-5405 has a torque of 200cmg, RPM 11,000 and draws current at 6.25 amperes. The RS-3805 on the other hand has a torque of 140cmg, RPM 12,800 and draws 2.8 amperes. This information shows that the RS-5405 motor produces more than double the power but consumes also double the current. A car using the RS-5405 motor will require many more pit stops for battery changes than one using the 380, and even though the car will be somewhat slower on the track, it will still be running while the former is in the pits for battery changes. Another point to consider is that with the high current flow of



the larger motor, the speed controller is more apt to cause trouble, and in any condition, the faster car is normally damaged to a greater extent because of the higher impact forces. A faster car is also more likely to drive during long races and mistakes in driving are more apt to happen due to the speed at which it is traveling. All of these considerations must be taken into account when selecting a vehicle and motor for long distance racing. A good rule to follow when working up a vehicle for endurance racing is to use a smaller motor for those tracks which have many tight corners and fewer straight runs, and use a higher performance engine with higher gearing for those tracks with long straight runs and few corners.

LONG DISTANCE RACING DEPENDS UPON TEAM EFFORT

Organizing a racing team

You can, of course be the driver pit crew and run an entire long distance race by yourself, however, you will not be overly successful very often doing this. Best results are obtained with a driver mechanic for battery changes, repair and adjustment, time keeper who records and times the laps, and a team manager who guides the team. Long distance racing can require more than one driver, so it is best if all team members are able drivers.

Team work gives the edge to your car

Once the team is formed the next step is to get it working together. Firstly all members must know and practice the role they are to play. The driver must run the car according to the team manager's instructions. It disrupts the team work when a driver struggles against other cars following his own selfish interests, or delays a pit stop etc. The mechanic is constantly preparing the batteries for changing and keeping track of which are fresh and those in a discharged state. They look the same and in the hushed atmosphere of a race, more than one dead battery has been replaced by another dead one. He should be adept in quickly removing the car body for battery changing, and adjusting steering and changing tires etc. The time keeper plays an important role in as much as he records all of the fundamental data that the team manager uses to formulate his race strategy and tactics. At a minimum, he should record the number of laps run and the speed time from the beginning of the race if possible he should calculate the average lap time of the team's vehicle, time the pit stop and record what was done, plus keep track of who was driving and when a change of drivers occurred. The team manager observes the progress of the other teams, and advises his driver as to pacing pit stops etc. The team manager and time keeper should not be drivers in this race. During the second half of the race, when there is almost no difference between your car and the rivals team, it is the data provided by the time keeper that will give the team manager the necessary information to guide his driver on to victory. It is the manager who is responsible for victory or defeat in long distance races.

Periodic pit stop maintenance

The number of pit stops made must be reduced to the absolute minimum. If you





only stops are for battery changes and/or driver change, then your race is progressing well. Keep in mind though, that it is also necessary to periodically oil bearings, and shafts. Polish and oil speed controls and to apply spray oil into motors and onto gears. This maintenance, although time consuming during a pit stop, must be done to prevent failure of a part due to lack of lubrication. Also look for any loosening screws and/or missing parts that may require maintenance during the next stop.

● Trouble pit stops

As soon as a problem is noticed by the driver he should pit the vehicle the next lap. To keep running the car with a problem will only create a worse problem, and perhaps one that can no longer be repaired during the race. After a bad collision or spin out, observe the vehicle for a lap or so, and if there is a problem pit it as soon as possible. During the latter stages of a race, it is difficult to judge if your vehicle is performing the same as at the beginning. You must compare your performance with your rivals, and if your vehicles running comes favorably with your opponent keep running it, even though you feel that it is not as good as at the beginning. If you make a stop and discover that it will take too long to repair the fault, continue running the vehicle, rather than expending the repair time. The managers judgement on this must be accepted.

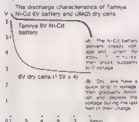
● Pit tools and spare parts

Keep the total number of tools in the pit to a minimum. However, make sure that you have all of the required tools to completely assemble the vehicle. A box wrench, for instance, is much better than an adjustable spanner. Needleless pliers and feelers are also required. If you take only one glue the instant cyanoacrylate is recommended. Gummed tape, vinyl tape and soft iron wire are also very useful for making emergency repairs. Take along enough parts to completely rebuild the vehicle. Extra parts for the front-end and steering, and those parts that require assembly should be assembled prior to the race, so that they can be installed as a unit, rather than part by part during a pit stop. Sponge type tires do not normally require replacement in races of two hours or under. Semi-pneumatic tires

will require replacement two or three times. As for diplo tires, if the center rubber part of the tire is not firmly fastened, it may come off during the race. Whereas sometimes become broken, so even if you are using sponge tires, take along spare wheels on which you have mounted new tires, properly balanced and rounded off. Be prepared for anything that could leaky or on. If you don't bring it, that's what will break during the race.

● BATTERY CHANGING DURING RACES

One very important (perhaps the most important) part of racing, is how long your batteries will last during a given time. Ni-Cd batteries have the ability to deliver a constant even voltage and current supply to the motor, until the battery is almost exhausted. If you are familiar with the circuit you will be racing upon, you already know how many laps you can get from your battery on that circuit, however, if you are racing



ing on a different circuit, it will be guess work on your part to know how many laps you will get from battery during endurance racing, where many battery changes are required, you must have the ability to judge when a pit stop for battery changing is necessary. Normally, you will bring the car into the pits about two to three laps prior to battery exhaustion. Running the car until it stops from lack of power is not good for the battery nor will you end up winning any races that way. Tires, driving technique, course length, number of laps required, course condition, type of motor all play a part in how long a battery will last. Be on the safe side and bring your car into the pits to get your battery down to the safe limit, by measuring the time or laps run. Make sure that your battery supply for the race is sufficient for the entire race, to include two or three extra batteries for protection in case of an accident on the track or battery malfunction. The smooth, steady driver who makes the required pit stops on time is the driver who will win endurance racing.

● RADIO CONTROL BATTERY LIFE

Normally, you will not require a fresh receiver or transmitter battery during a race that is not longer than one hour. If you start the race with fresh batteries or recharged Ni-Cds. Note however, that the

more services you use the more the receiver battery is used. Whatever equipment you use, you must be familiar with the normal life expectancy of the batteries, and there is a possibility of the race lasting longer than expected, prepare extra batteries beforehand, just in case they are needed at a pit stop.

TECHNIQUES FOR WINNING LONG DISTANCE RACES

Endurance or long distance races are very much like human distance racing. To win you must establish and keep a steady pace throughout the race, avoiding useless dashs and other rituals at all times. Keep clear of trouble on the track and run your car at a steady even pace.

● Start

You do not have to Jack Rabbit, start fast it easy and run carefully at the beginning, especially at the first corner, where accidents often occur. Enter the corner high, even if you are left behind at this curve. Accidents at the beginning of the race often leave the driver irritated and confused, and the original plan of racing is lost. For the first two or three laps be very deliberate in your driving. You will start to relax, learn the track and how the others are pacing themselves. If you cannot catch out, don't become upset and dash to catch up. Keep the pace and drive smoothly.

● How to pass and get ahead of rivals

Success in long distance racing usually comes from not being in the lead for most of the race. When you are the front runner you are always concerned about those who are behind you, trying to pass. If you cannot maintain enough distance in the lead over your rivals, it is better to let one or two pass you, than constantly worrying about them. You can then take the lead when the last lap is to pass, and when the time comes for you to pass, or it might after a corner that is followed by a long straightaway. Even if your car seems to be slower than others in the race, you still have a good chance of winning. Remember that the faster a car runs, the more battery it consumes, and the faster cars will have to make more pit stops. This is your chance to catch up and pass the faster cars. If you are racing on your own pace, throughout the race, you have a good chance for the winner's trophy.

● RELAX WHEN CORNERING!

During the endurance races, take the mid die or high corner rather than at the track inside edge. This is where many accidents occur, and this is where they are trying to spin from their last spin out will be fighting for that inside lane, and most likely spin out again. If you are there, you could be knocked out in the accident. Stay high in the corner and not lose track of time when you need the extra speed and dash for winning the race. Relax and win!



RECORD THE RACE!

In long distance races, it is advisable to keep a record of the race, after you will be able to review it with your team mates and determine where time was lost. This is a very useful and positive approach to improve and strengthen your team for other long races.

● Pit records

This is the record of all pit stops of your car. Which laps the stops occurred, how long the stop was for. The reasons for the stop and what was done to the vehicle at each stop. Perhaps you or a changed driver and batteries or perhaps changed tires due to new track conditions (rain, oil on track, etc.). Whatever the reason, this information will assist you in making a better overall plan for the next long distance race.

● Race progress records

Billis is a record of the progress of the race, lap by lap. It will consist of the lap times, driver's name and any other information deemed necessary during the actual running of the car in the race. This information will provide you with planning data for future races as to which driver is best for certain conditions, number of laps expected during an hour of driving time, and number of pit stops expected.

● Lap record listing

This is the data which the promoter of the race records. The number of laps of each team is recorded every 5 minutes. From this record, the pace of each team is determined, and the progress of the race. He will also know who is ahead and who when the race ends, who the team is a winner.



OFF ROAD DRIVING CARE

OVER RUNNING YOU CAN CAUSE MISHAPS AND PROBLEMS

Even though you own an off-road vehicle, you must select your driving areas with care to keep your vehicle in good condition. Inconsiderate driving will cause trouble and possible damage to your car.

1 UNSUITABLE DRIVING SURFACES

● DRY RIVER BED

A dry river bed where many large rocks are found is perhaps the worst place for driving an off roadder. In 1/10 scale, even a stone with a 10cm dia is the same as a 10 meter dia boulder in real life. Driving against these objects is like intentionally destroying your vehicle.

Driving in a dry river bed can damage the car.



● GRASSLAND

Grasslands with tall grass and stems are bad for buggies because the grass can become entangled in the rear shafts and universal joints, which cause an unnecessary load on the motor which can cause overheating.

Note: grass can become entangled in rear shafts.



● ASPHALT AND LAWNS

Highspeed cornering on concrete, asphalt or smooth lawns will cause the vehicle to roll. Slow down a little when cornering on these surfaces.



3 DIFFICULT SURFACES

● GRAVEL AND DRY SAND

These surfaces offer considerable resistance to your vehicle. There is a bus

dan on the motor and it will use much more current. The vehicle will not move as fast on this type of terrain, and on loose dry sand the tire can become buried and spin, without moving the car.

Three dig into sand



Dynamic jumping is a part of off road driving. However, you can damage your car if you do it recklessly. A jump must be done so that the rear wheels land first with the vehicle level in order for it to be in a level slightly nose high attitude; you must leave the ramp squarely and not enter it from an angle. If you do not do this, the car will tend to tumble while it is in the air and

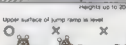
incorporate jump



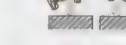
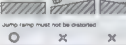
Good ramp: good jumping style



Heights up to 20cm.



Jump ramp must not be dashed



land off balance. Your jumping ramp can be up to 20cm in height for safe, smooth jumps.

Straight jump



WATER AND PONDS

Although the rough rider and sand scorp enter plus others are water resistant, water can enter the mechanism box due to water pressure if the car is allowed in deep water. The safe depth of the water hazard is up to the lower edge of the wheels.

Note: depth of pool. Depth is allowed up to wheel



A straight run for acceleration

Grass and clumps are dangerous for added driving techniques

High speed corners must be a wide corner must



High speed, full counter steering corner

OVER DIRT COURSE

An oval dirt course can be set up on school grounds and parks. Although it is simple you can improve your driving technique quickly on this type of track.



Cars with water resistant mechanics boxes can be washed down with a hose if they are dirty. Hold the vehicle by the front bumper and let it hang down vertically while cleaning off with the hose. Do not dip the car in a bucket of water because the pressure will allow water to enter into the box through the vent holes. For a thorough cleaning it is best to remove the mechanics box entirely, then immerse in water will not harm the radio gear.

*After running the vehicle through water or after washing, it is a good idea to open up the mechanics box and wipe out any moisture that may have been induced, then dry it in an dry place. Desassemble the gear box and oil the gears, bearings and suspension.





TENTS IN BUILDING UP 4X4 VEHICLES

Tamaya's R/C 4WD vehicles offers you the unique enjoyment of working with 4 wheel drive mechanics, and they are very much suited to experienced drivers as well as beginners. Since the radio system is located in a sealed compartment, you can utilize the vehicles for heavy duty driving in all climates.

FOR THOSE JUST GETTING INTO 4X4 VEHICLES

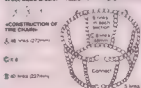
Tamiya's R/C 4WD vehicles are best matched with a 4 channel, 3 servo radio system. There are many radio systems on the market that can be utilized and are very reasonably priced. Use a 4 channel system for maximum flexibility with your Tamiya 4X4's.

FOR THOSE WHO ALREADY
POSSESS A 2 CHANNEL
RADIO SYSTEM

If you already own a 2 channel system and purchase a Tamiya 4X4, you can gain experience with it by installing your present system. Although you cannot shift the gears with the radio, you can still enjoy very powerful driving. When you get bored with the inability to shift gears, then it's time to go out and purchase a 4 channel set. You will have the same enjoyment with your 4X4 using a 2 channel radio, as with any of the regular 2 channel R/C cars, however maximum enjoyment comes with the ability to shift gears with the radio.

HOW TO MAKE SNOW CHAINS

4 wheel drive vehicles can be effective in snow, however, for more positive traction snow chains are suggested. These are easy to construct using small linked chains found

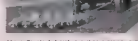


at hobby and do-it-yourself shops. Referring to the full sized figures and photos, fabricate a snow chain as shown. Add the four hooks and attach the rubber band. To pull onto the wheel, stretch the rubber band and insert the tire and wheel. Adjust the chain as shown. Length of the chain shown is for the Toyota Hi-Lux 4X4. By shortening the chain, it can be used for the 4X4 Blazing Blazer. For best results, the chains are suggested for the rear wheels only.



TOYOTA 4x4 PICKUP ON SNOW

Challenge snow driving with real tire snow chains. Of course the A/C Toyota pickup can't move in deep fresh snow but runs easily on 2cm-3cm fallen snow. Enjoy 4x4's on sloing streets.



Above: Toyota 4x4 pickup putting a grown-up on skate board. Below: 1:18 Tamiya R/C 4x4 pickup can pull a real Toyota 4x4 pickup.

adequate without a firm foundation. Or a Sunday chore by the club members to lay concrete surfacing may suffice for the purpose. Some unevenness and slope will not be a cause of trouble, but drainage should be planned carefully.

Shortly mowed lawn on the side space of the course is ideal when considering deviation of cars from the track. However, it would call for time and care to grow. On the Tamaya C. cut natural turf is employed on the space between the roads and outside spaces are kept as dirt surfaces. In cases of dirt surface, the pebbles should properly be picked up and the surface tamped down. A soil, grass and leaves must be deposited since they might jam into a shift of the car. The point of the track and the side space may be built on one level or in a gentle slope the outside being high. There should be any rise and fall between surface levels in order to allow a car that de-

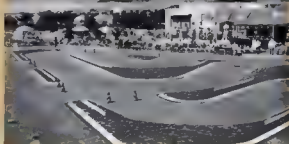
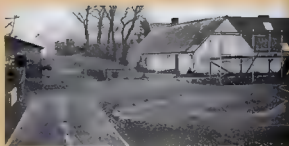
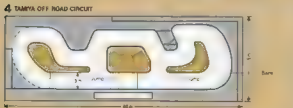
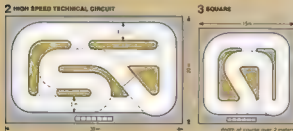
viated to get back to the course with ease. When the space between courses is very narrow, some device may be needed to keep a car from jumping into the next course.

7. DRIVERS CONTROL STAND AND OTHER ACCOMMODATION

The larger a circuit is, the taller the control stand must be. The Tamaya Circuit has a control stand of 120 meters high. However, when a stand is too high, it would be inconvenient to step up and down. Sometimes a hand rail for safety's sake may be necessary.

Besides bridges and gates on the circuit, a signpost for starting, a control tower, sign boards of sponsors, and things like that are desirable so as to boost up the atmosphere. Hints of such auxiliary props can be obtained in car and racing magazines.

MURIOUS PLANS OF CIRCUIT LAYOUT





RALT RT2 RALT 420R



18 RALT RT2 RALT 420R

This car has a chassis and engine that are RC, a steering rack and suspension that are the top of the line, and a body that is a replica of the original. The car is made of aluminum and has a 1/10 scale engine. The car is made of aluminum and has a 1/10 scale engine. The car is made of aluminum and has a 1/10 scale engine.

About the chassis: The Ralt RT2 showed its speed in the 1979 European F2 Championship. It's a ground effect car, adopted from the F1 series, and mounts the most straight four-cylinder engine in the world. It's a 1/10 scale model of the original, and it's made of aluminum. It's a 1/10 scale model of the original, and it's made of aluminum.

The car is made of aluminum and has a 1/10 scale engine. The car is made of aluminum and has a 1/10 scale engine. The car is made of aluminum and has a 1/10 scale engine. The car is made of aluminum and has a 1/10 scale engine. The car is made of aluminum and has a 1/10 scale engine. The car is made of aluminum and has a 1/10 scale engine. The car is made of aluminum and has a 1/10 scale engine. The car is made of aluminum and has a 1/10 scale engine.



1/10 SCALE 1/10 1/10

HONDA F2



30 HONDA F2 (COMPLETION SPECIAL)

The Honda motor company is again in the vanguard of back racing in Japan and Europe. This kit reproduces a model with performance, the 1981 Honda F2. It's a 1/10 scale model of the original, and it's made of aluminum. It's a 1/10 scale model of the original, and it's made of aluminum.

About the chassis: We can say that 1981 was a Honda year in F2, as the F2 machines they imported the Honda type F2, and they did extremely well in Europe. The 1981 Honda won 6 victories in the F2 series, and it's made of aluminum. It's a 1/10 scale model of the original, and it's made of aluminum.

The car is made of aluminum and has a 1/10 scale engine. The car is made of aluminum and has a 1/10 scale engine. The car is made of aluminum and has a 1/10 scale engine. The car is made of aluminum and has a 1/10 scale engine. The car is made of aluminum and has a 1/10 scale engine. The car is made of aluminum and has a 1/10 scale engine. The car is made of aluminum and has a 1/10 scale engine. The car is made of aluminum and has a 1/10 scale engine.



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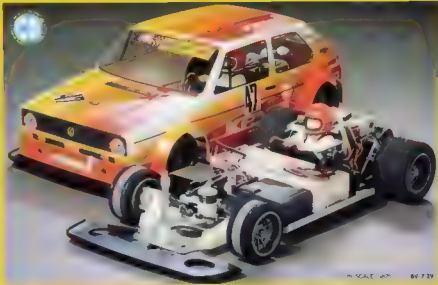
With its unique body-body styling, this ultra-Resolute will lead the pack in RC propulsion categories. With the superb 100 arms and up-arms, and the new 400 steering system, this RC car was designed for fast and rugged use. The 2000-2001 RFD, built by the RFD team, is easy to use and simple to maintain. The 400, 600, 800, and 1000 are the most popular body styles. The 400 is the most popular body style. The 600 is the most popular body style. The 800 is the most popular body style. The 1000 is the most popular body style.

About the wrong guy? The Renault 5 Turbo is mid-level version of the very popular Renault 5. A four-wheel drive compact car. Although it uses a different chassis and mounts a 265-hp turbo engine amidships. A 2+ retains the good looks of the standard 5 and it won the Monte Carlo Rally in 1981.

[illegible] $2H^+ + 2e^- + 2Al \rightarrow 2Al^{3+} + 3H_2$ 6V 7.2V

The Volkswagen Golf one—the world's bestselling automobile—makes an attractive RTR racing car only in a disguised way. It's a new DTM F1P, name and aluminum RTR deck and a sophisticated saving steering system with three sub-actuators and coupled in a variable pneumatic body. In RTR wing at a 1:1 scale, it takes the hatched flag often in many laps.

1. *Handel's opera, **Giulio Cesare**, is the 1st of his 2nd cycle, which he wrote in 1724. It is a 3-act opera, and it is the first of his 2nd cycle, which he wrote in 1724. It is a 3-act opera, and it is the first of his 2nd cycle, which he wrote in 1724.*
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[illegible]

High performance AT racing in a sustainable form. Using the best aspects of the American built but having some of the high end parts and subassemblies from a Japanese components Japanese built bike would be a good way to find a middle way between the two. In those terms, high performance parts as they need them. Mixed components and a possibly affordable body design with light weight good load distribution and real economy.

About the Enduro: ♦ It's widely popular, and has been spotted 5 times, being seen more often on racing circuits around the world, and the 2800i was specifically developed for the SCCA Sports Car Club of America competition, where the 911 Porsche and Savanna RIX are the rivals to beat.


$$m = 5.4 \times 10^{-14} \text{ kg} \quad T = 2.9 \times 10^{-10} \text{ s} \quad \omega = 3.4 \times 10^9 \text{ rad/s}$$


SCALE 150221 05-7.27

WILLY'S WHEELER
NASCAR CITY TURNING RACING



WILLY S. WHEELER

The distribution of the χ^2 statistic is given by the following table:

df	0.99	0.95	0.90	0.80	0.70	0.60	0.50	0.40	0.30	0.20	0.10	0.05	0.025	0.01
1	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044
2	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100
3	0.0158	0.0158	0.0158	0.0158	0.0158	0.0158	0.0158	0.0158	0.0158	0.0158	0.0158	0.0158	0.0158	0.0158
4	0.0200	0.0200	0.0200	0.0200	0.0200	0.0200	0.0200	0.0200	0.0200	0.0200	0.0200	0.0200	0.0200	0.0200
5	0.0239	0.0239	0.0239	0.0239	0.0239	0.0239	0.0239	0.0239	0.0239	0.0239	0.0239	0.0239	0.0239	0.0239
6	0.0275	0.0275	0.0275	0.0275	0.0275	0.0275	0.0275	0.0275	0.0275	0.0275	0.0275	0.0275	0.0275	0.0275
7	0.0312	0.0312	0.0312	0.0312	0.0312	0.0312	0.0312	0.0312	0.0312	0.0312	0.0312	0.0312	0.0312	0.0312
8	0.0350	0.0350	0.0350	0.0350	0.0350	0.0350	0.0350	0.0350	0.0350	0.0350	0.0350	0.0350	0.0350	0.0350
9	0.0389	0.0389	0.0389	0.0389	0.0389	0.0389	0.0389	0.0389	0.0389	0.0389	0.0389	0.0389	0.0389	0.0389
10	0.0429	0.0429	0.0429	0.0429	0.0429	0.0429	0.0429	0.0429	0.0429	0.0429	0.0429	0.0429	0.0429	0.0429
11	0.0470	0.0470	0.0470	0.0470	0.0470	0.0470	0.0470	0.0470	0.0470	0.0470	0.0470	0.0470	0.0470	0.0470
12	0.0512	0.0512	0.0512	0.0512	0.0512	0.0512	0.0512	0.0512	0.0512	0.0512	0.0512	0.0512	0.0512	0.0512
13	0.0554	0.0554	0.0554	0.0554	0.0554	0.0554	0.0554	0.0554	0.0554	0.0554	0.0554	0.0554	0.0554	0.0554
14	0.0597	0.0597	0.0597	0.0597	0.0597	0.0597	0.0597	0.0597	0.0597	0.0597	0.0597	0.0597	0.0597	0.0597
15	0.0640	0.0640	0.0640	0.0640	0.0640	0.0640	0.0640	0.0640	0.0640	0.0640	0.0640	0.0640	0.0640	0.0640
16	0.0683	0.0683	0.0683	0.0683	0.0683	0.0683	0.0683	0.0683	0.0683	0.0683	0.0683	0.0683	0.0683	0.0683
17	0.0726	0.0726	0.0726	0.0726	0.0726	0.0726	0.0726	0.0726	0.0726	0.0726	0.0726	0.0726	0.0726	0.0726
18	0.0769	0.0769	0.0769	0.0769	0.0769	0.0769	0.0769	0.0769	0.0769	0.0769	0.0769	0.0769	0.0769	0.0769
19	0.0812	0.0812	0.0812	0.0812	0.0812	0.0812	0.0812	0.0812	0.0812	0.0812	0.0812	0.0812	0.0812	0.0812
20	0.0854	0.0854	0.0854	0.0854	0.0854	0.0854	0.0854	0.0854	0.0854	0.0854	0.0854	0.0854	0.0854	0.0854
21	0.0897	0.0897	0.0897	0.0897	0.0897	0.0897	0.0897	0.0897	0.0897	0.0897	0.0897	0.0897	0.0897	0.0897
22	0.0939	0.0939	0.0939	0.0939	0.093									



LAUREN HALL



LANCIA RALLY

[illegible]

The FROG



THE FROG



SUBARU BRAT



SUBARU BRAT





33 AUDI QUATTRO RALLY
1981-1982

As a result of the Audi Quattro's success in the 1981-1982 season, the car was entered in the 1983 season. The car was entered in the 1983 season, but it was not entered in the 1984 season. The car was entered in the 1983 season, but it was not entered in the 1984 season. The car was entered in the 1983 season, but it was not entered in the 1984 season.



1/100th SCALE 507 - 69-726-774

OPEL ASCONA 400 RALLY
1981-1982



34 OPTEL ASCONA 400 RALLY
1981-1982

The Opel Ascona 400 Rally was a four-door sedan that was entered in the 1981-1982 season. The car was entered in the 1981-1982 season, but it was not entered in the 1983 season. The car was entered in the 1981-1982 season, but it was not entered in the 1983 season. The car was entered in the 1981-1982 season, but it was not entered in the 1983 season.



1/100th SCALE 507 - 69-726-774



The GRASSHOPPER



43 The GRASSHOPPER マダガスカル

This gift was a real show-stopper. At those who get into the world of RC modeling, you have a lot of choices. One of the most popular is the Grasshopper. It's a small, lightweight, and easy to handle car that can be built in a variety of ways. It's a great car for beginners and experienced builders alike. It's a car that can be built in a variety of ways. It's a car that can be built in a variety of ways.

About the grasshopper, the Grasshopper is a small, lightweight, and easy to handle car that can be built in a variety of ways. It's a car that can be built in a variety of ways. It's a car that can be built in a variety of ways.

The Grasshopper is a small, lightweight, and easy to handle car that can be built in a variety of ways. It's a car that can be built in a variety of ways. It's a car that can be built in a variety of ways.



43 MISSION PAJERO ミッドウェイ

The RC Pajero is a full-size off-road vehicle with a lot of space for the engine and a lot of room for the driver. It's a car that can be built in a variety of ways. It's a car that can be built in a variety of ways.

About the mission, the Pajero is a full-size off-road vehicle with a lot of space for the engine and a lot of room for the driver. It's a car that can be built in a variety of ways. It's a car that can be built in a variety of ways.

The Pajero is a full-size off-road vehicle with a lot of space for the engine and a lot of room for the driver. It's a car that can be built in a variety of ways. It's a car that can be built in a variety of ways.



1/10th SCALE (RTR) 6V 2.2V



1/10th SCALE (RTR) 6V 2.2V

1:64 WEST GERMAN LEOPARD A4



3 WEST GERMAN LEOPARD A4

This is a model of the West German's first and best tank. It is a tank that has been built in a large number of variants, but the A4 is the most common. It is a tank that has been built in a large number of variants, but the A4 is the most common. It is a tank that has been built in a large number of variants, but the A4 is the most common.

About the Leopard A4, the most important thing to know is that it is a tank that has been built in a large number of variants, but the A4 is the most common. It is a tank that has been built in a large number of variants, but the A4 is the most common. It is a tank that has been built in a large number of variants, but the A4 is the most common.

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FLANZPANZER GERARD

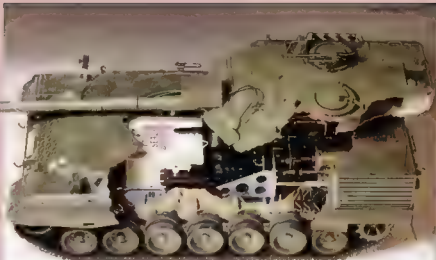


3 WEST GERMAN GERARD

This is a tank that has been built in a large number of variants, but the Gerard is the most common. It is a tank that has been built in a large number of variants, but the Gerard is the most common. It is a tank that has been built in a large number of variants, but the Gerard is the most common.

About the Gerard, the most important thing to know is that it is a tank that has been built in a large number of variants, but the Gerard is the most common. It is a tank that has been built in a large number of variants, but the Gerard is the most common. It is a tank that has been built in a large number of variants, but the Gerard is the most common.

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PORSCHE 906 RACING MASTER VA 5 1102-5602



PORSCHE 906 RACING MASTER VA 5 1102-5602



PORSCHE 906 RACING MASTER VA 5 1102-5602



The GRASSHOPPER 10-5602



The GRASSHOPPER 10-5602



BUILDING A HIGH PERFORMANCE CAR



type of radio control car, you may choose metal chassis and metal wheels. Metal cars are easy to control and some are not as fast as others.

FUNDAMENTAL REQUIREMENT IS THAT THE CAR GOES STRAIGHT

Even with a real automobile, moving in a straight line is the essential condition. A model should be so adjusted that it takes a baseline for 5 meters or so without touching the steering wheel. A car which does not go straight cannot be controlled easily. Note the following points:

- 1. A car with distorted chassis would



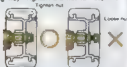
it go straight, therefore correct the chassis so that the four wheels should catch the ground evenly. Particularly after delivery, look into it carefully.

- 2. If any wheel should not rotate smoothly, the car would turn in the direction of that wheel. Assemble a car with care so all wheels revolve evenly. This is related to air's turning capability.



- 3. With a bent rear axle the car will keep turning.

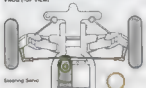
- 4. When a wheel is not secured firmly with the nut, the car may be going in a zigzag way. Tighten the nut to keep the



wheel in position in such a way that there is no play between the wheel and the axle. But still allow the wheel to turn smoothly.

- 5. The steering servo and servo horn should be arranged so that the front wheel will head forward right and the attitude of the servo horn is parallel to the front

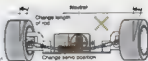
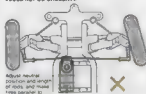
FRONT VIEW



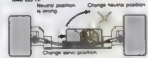
it GOES STRAIGHT BUT TURNS UNEVENLY RIGHT AND LEFT.



DOES NOT GO STRAIGHT.



it GOES STRAIGHT BUT TURNS UNEVENLY RIGHT AND LEFT.



wheels (some cars requiring a right angle) when the steering servo (consequently the steering shock and trim lever) is in the neutral position. When the arrangement is not right, the car would not go straight or it will change its course.



unevenly to right and left. Being installed with a screw servo horns can be readjusted by unscrewing.

- 1. Try to mount radio control units and batteries into a car, balancing the car evenly.

- 2. Be careful that lines and steering linkage will not rub against the body. Lately have a last run to see if it advances in a baseline. If not, adjust it with the trim lever on the transmitter. With the trim lever you can do the fine adjustment of servo.

SERVO HORN MOVEMENT



TRANSMITTER



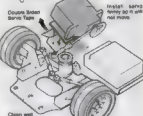
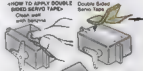
movement, having the same effect of shifting servo position. (BENT) A car with long wheel base in relation to track has stability and tendency of going straight.



2. HOW YOUR CAR TAKES CORNERS

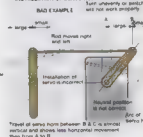
A car which goes straight is easy to control in principle. Such a car should have no peculiar action when taking corners. Cars with a peculiar way when turning can be corrected in the following ways.

- 1. The direction of front wheels are controlled by the movement of a servo. In case a servo is not secured in position, the car tends to be unstable, having a jacking or not responding to the control properly or turning unevenly right and left. When dual-sided adhesive tape is



used for mounting a servo, wipe the surface of the servo with cloth dampened with benzine or solvent carefully. (Lacquer thinner may dissolve servo cases.)

INSTALLATION OF SERVO HORN

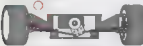


Correct installation of servo horns

Servo horn is in the correct neutral position



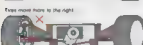
The steering of the right and left tires corresponds to the tilt of the servo horns



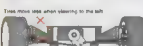
When servo horn is installed incorrectly



Servo horn up to the incorrect, neutral position



Tires move more to the right



Tires move less when steering to the left



Correct assembly of the differential



Bad steering



● In most cases where the car does not corner evenly, i.e. a small turn to the right and a bigger turn to the left under the same steering angle, it is caused by incorrect installation of a servo horn to the servo. In such a case straighten the problem by taking the procedures as per stated in the previous chapter. Fundamental Requirement is That the Car Runs Straight

● When a differential gear does not work properly (the same state as if without a differential gear), the car is apt to make a big turn or take corners awkwardly. Check it by holding one wheel firmly and turn the other wheel smooth rotation indicates the differential gear is in good condition

CHECKING DIFFERENTIAL GEAR



Allow some play in gears

WHY DIFFERENTIAL IS USED -

● On/Off wheels drive more a longer or short wheel shafts



When the car is turning, the wheels are driven by the motor shafts. The wheels which are longer or shorter than the motor shafts will have a longer or shorter wheel shafts.



When it does not, try to give some play in the gear meshing

● Check whether or not a servo rod, servo horn or wheels are in contact with something like the car body and preventing right movement



● Of the lag pin of the front wheels. Steering will then operate lightly

● SLEW (degree of changing direction of front wheels) can be varied by changing the connecting point of the servo rod. It is recommended for a beginner to select small slewing

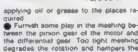


3. FOR SPEEDING UP

Most electric car kits are produced to come out with similar performance in practice. However, the models assembled will show varied ability. The reason why some cars do not run faster than others are in most cases that they have additional friction around the rotating parts in other words they have a rotating section which either partly or all does not revolve smoothly. The following are the points to take care of needless to say

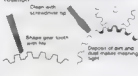


● Lubricate screws and adjust

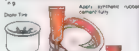
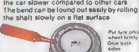
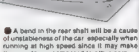
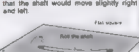
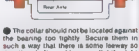
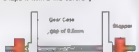


● Gear meshing can be adjusted by moving motor up and down. Adjust it so there is 0.5mm play in meshing

● Apply oil or grease to the places required

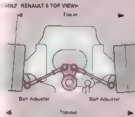
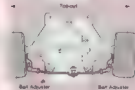
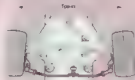


● A chipped or deformed gear tooth will diminish the rotation. Particularly a brass gear is easily warped. In such a case, reshape it with a file carefully



locked. Do it without fail. Poor rotation on the front wheels influences the car's speed more unfavorably than you may think.

• Improper toe-in and toe-out adjustments are resistant to the car. The model car runs well without toe-in and toe-out or with a few degrees of either.



ADJUSTMENT OF THE LENGTH OF THE ROD



Daily up-keep of your cars is important for maintaining performance. This will help you to find any possible defect. Without daily care the capabilities of acceleration and maximum speed of your models can deteriorate. Keep your cars in the best condition possible at all times.

1. CARE AFTER RUNNING

After running your model be sure to clean it and carry out any necessary repairs ready for the next time you wish to run the car!

ATTENDING TO CONTROL MECHANISMS

The radio control units and switches will be covered with dust after the model has been running. The contacts of the switches must be cleaned in order to avoid poor contact. Any component damaged or out of position must be replaced or repositioned. Dry cells may be in need of re-charge. Also check the batteries of the radio control units. As a general guide, the receiver batteries are exhausted sooner than those of the transmitter. Inadequate batteries tend to be a cause of many breakdowns.

DIRTY COMPONENTS AROUND THE CHASSIS

After a day's activity, all parts and sections around the chassis will be in a dirty condition. Look particularly at the moving parts; any foreign objects in the bearings influence the rotation of the wheels. For inaccessible places use Tamiya Oil Spray, which has a detergent effect and is very useful for cleaning. Check if any nut or bolt is loose and oil all journal sections. See if the rear axle is bent; replace if necessary.



DAMAGE TO BODY

Radio controlled racing cars are not only for running, but are also like scale models. It is certainly not recommended to run the cars without a windscreen, with a

door broken, or with a big hole on the body or any similar damage. Always keep your model in the best condition possible. Items you will probably need for repairing are plastic sheet and different kinds of glue. Synthetic rubber cement and instant glue are useful, as well as plastic glue.

2. TO KEEP YOUR CAR AT PEAK PERFORMANCE

Parts will wear out or become broken after periods of high speed running and use. Replace any damaged parts and keep your model constantly rejuvenated.

MAINTENANCE OF ELECTRIC SYSTEMS

• REPAIRING ELECTRIC WIRE

The electric wire is able to withstand to some degree moisture and stretching. Accidental contact of exposed wires will result in a short-circuit, which may damage the battery, motor or switch, sometimes causing components to burn up. A wire out of place may jam into a shaft of the car. When the wiring of radio control units or antenna becomes short-circuited, or when the wiring of a car rubs against a gearcase or other parts which results in a noise being emitted, the radio control unit

Bolder down to split which is out of place

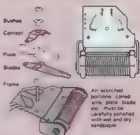


will be disturbed and will not operate correctly. If the insulation should come off any part of the exposed electric cord, it must be mended immediately and thoroughly. Any joints in the wiring about to break should be repaired firmly, preferably by soldering. If a radio control unit or antenna should fail to work correctly, it must be repaired by a competent radio repairer.

• POOR CONTACT OF WIRING

Since it draws a lot of current, the speed control switch when it sparks will scorch its contact points. This scorching will, after a while, cause poor contact. The points of the connectors and switches must be polished once in a while to allow electricity to flow with less resistance. Most poor contacts in the connectors may be repaired by a screw driver: refer to the chapter headed "Trouble Shooting." Scorched contacts of a switch should be carefully polished with very fine sandpaper. Metal contact surfaces wear away after repeated use, particularly ones in a

Exhausted wire of stepless variable speed switch



speed control switch which are used as celessly, and should be replaced after some period of operation.

MAINTENANCE OF MECHANISM AND CHASSIS

• LOOSEENING INSTALLATION OF RADIO CONTROLLED UNITS

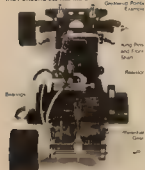
The adhesive power of double-sided tape is much reduced after one application. If the tape is reused to install servo or receivers, the units will be moved out of position due to accidents or vibrations. Loose bolts and nuts fixing the servo bands and servo trays may result in inaccurate control of the car. For "fastening" steering servo and speed control servo firmly, renew the tape and tighten loosened bolts and nuts. Keep the double-sided adhesive tape in a cool and dry place, otherwise its adhesive properties may deteriorate. On the other hand, if tape applied will not come off easily, wipe it with a cloth dampened with benzine or water. The same cloth moistened with benzine assures strong adhesion if used to clean the surfaces of objects, i.e. servos and servo mounts, before applying the new tape.



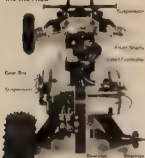
LOOSEENING AND DETERIORATION OF BOLTS AND NUTS

Nuts and bolts are indispensable assembly parts and can become damaged during the running of the car or by misuse. Screws tightened excessively may twist off, or the thread may become worn. Bolts can be bent during collision and if not replaced could snap off during racing with disastrous results. Therefore, it is sensible to always change any bolts and screws that are bent, cracked or damaged in any way, before the next race.

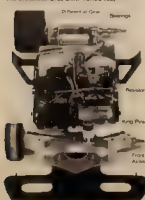
1/12 PORSCHE 956 MR. M. 5



1/10 THE FROG



1/10 KRABHAM BT50 BMW TURBO (C)



Check that all nuts and bolts, including lock nuts for losing the shells and all other small screws, have not slackened. Retighten if necessary.

MESHING OF GEARS

The gears play a vital role in transmitting the motor power and they are subject to wear. Any dirt and dust between the gear teeth will act as a file and abrade the surfaces and any such deposit should be removed carefully. Occasionally gears may be broken by small pebbles and these must be replaced. Your car will run much better if regular attention is given to the careful cleaning etc. of the gears. Check that the gears have not worn away so that they have to much play and cannot be adjusted. New gears require running in. If

New gear



Gear worn edge

possible, do not use new gears for races until run in.

CHASSIS TUNING

The performance of your car will be greatly affected by the state of the car's chassis. A bent warped, or otherwise deformed chassis will cause the car to have different cornering characteristics. A damaged front chassis and gearbox will similarly adversely affect the performance of the car. Check for any twist or bend of the chassis by placing it on a flat surface. Some twisted chassis may be reformed. A crooked chassis may possibly be repaired by pounding with a plastic hammer. However this may weaken the structure and make it impossible to fit perfectly.

GREASE-UP POINTS

It is necessary to grease around the front and rear axles where parts rub against each other to reduce friction and abrasion. After races, besides checking of structural or mechanical parts, it is important, especially after races in the rain or through puddles, to look for signs of rust on metal parts and to check if rotating parts require oil or grease. Correct lubrication gives not only smooth rotation of wheels, but also allows proper adjustment to the steering and gear smooth operation. Lubricate the meshing of the gear teeth, suspension systems and around the rear axles which are influential in giving effective power transmission. The Tamiya Oil Spray is very useful for taking care of these sections.

TROUBLE SHOOTING



1. WHEN THE CAR FALLS TO MOVE

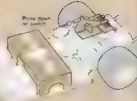
● See if the switching servo operates properly. If not, you may have neglected to switch on either or both your transmitter and receiver or your batteries are dead. You may have even failed to install batteries. Also, the wiring between the receiver servo and the servo may be loose. The receiver and the servo may be disconnected. Inoperative radio control units can be detected by replacing them with another unit.

● Remove the pushrod between the speed control switch and the switching servo. If the servo operates correctly, then the method of installing the rod or the position of the servo may be wrong and excessive resistance may hinder the movement of the servo. Something may also be in the way of the movement of the speed control switch. Please also refer to (7) in When the Car Does Not Gain Speed for methods of mounting a servo correctly.

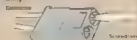
● When the switching servo and the speed control switch are operative and the motor (servo) is not moving, check the battery or charged, and the fuse is in good condition. If the fuse is blown, check the fused portion, referring to Causes of Blown Fuse, before replacing the fuse.

● Remove the motor from the gearbox and see if it will run. If it does, the meshing of the gears may be too tight, or the rear axle or the drive shaft may be seized. Remove the axle or shaft and carefully polish the seized part with sandpaper and lubricate it. Determine if the axle or shaft will revolve smoothly in the bearings. For Speeding Up in Building Up a Car of Full Running Capability is good reference material for this.

● When the motor is removed from the gearbox and does not run, incorrect wiring or poor contacts in the battery box, switch or in the connectors are possible. Check the wiring first. If nothing is wrong with it, press down on the battery box, switch and connectors. If the motor starts to run, it indicates that the component pressed on may have a poor contact or connection.



● The connector may wear out and develop a bad contact after repeated use. Crimp the tubular contact point using the tip of a screwdriver to make the contacts slip in firmly.



● Since the motor is precision made, it can become damaged when dropped, dipped into water, short circuited or connected to too many batteries.

2. WHEN THE CAR DOES NOT GAIN SPEED

● Make sure the speed control switch operates properly. If the switch goes into high speed only in the reverse position, or when manipulated by hand with the servo rod disconnected, the neutral position of the servo may be out of adjustment. Adjust it with the trim lever of the transmitter. After that adjustment, if it does not shift into the reverse speed but it works correctly in the forward setting, see if the servo and the servo rod are installed correctly as illustrated below so that the switch blade can go to the



If the switch blade does not make contact with the top speed setting, loosen screws and move switch arm in direction of arrow. (Steering angle of the servo horn must be at least 31 degrees if less, you may not put the servo into reverse. Speed will have adjusted the blade for contact with the top speed position.)

● This new type of speed controller has the switching type connected directly to the servo horn. Make sure that the connection wires are free to move with the servo horn, and not obstructed in any way.

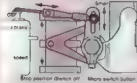
1. Adjust hole position of servo horn so that switch blade moves to the lower position when servo stick is pushed up to full.



2. Adjust the height of servo horn and wiper plate as even as possible. Bad contact happens in top speed position. If the difference between the two is large

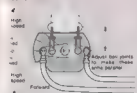
11. SPEED CONTROL SWITCH

1. Adjust the movement of switch by turning pot.

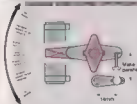


2. Micro switch works when the wiper arm is on the top speed position

12. GEAR SWITCH

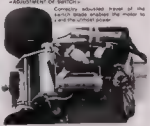
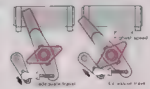


3. Wiper moves with switch plate and are required full length. If they are restricted by the battery, contact can be bad and control difficult



4. When you use a variable resistor speed controller attach servo so that switch plate goes to top speed position. If the switch plate doesn't move correctly troubles can

5. way to the maximum speed and the adjustment is incorrect and the switch blade does not move all the way to the end or goes over it, problems may arise



6. When the travel is inadequate the blade goes back the contact plate. The car can not run when the speed control switch is in the maximum position



7. The adjustment of the blade should be made referring to the assembly instruction sketch of the kit



8. A switch in a position causing it to be burnt out



9. Coils of Racing Speed Controllers get burnt and its color will change but this is not a problem

With inadequate travel of the switch blade the coil produces heat and the colour of the blade will change and the coil will burn out

10. If the motor does not run at the maximum speed when the speed control switch is in its maximum position, poor contact of batteries or of the switch terminals can be suspected. The poor contact can be found by grasping the switch as it is moved into the high speed position

11. Check to see if the gear meshing or the shafts are too tight. Make sure the wheels on axle smoothly. Be sure to lubricate shaft and gearbox

3. ABOUT VOLTAGE DROPPING RESISTORS IN R/C CARS

1. To vary the amount of voltage passing to the motor so that different speeds can be obtained. Resistors impede the flow of current from the battery to the motor and the speed current is shed off in the form of heat. At full speed, the resistor is not impeding any current flow, so there is no heat to dissipate. When "throttling" back, slow down, or run at a slower speed, the fixed resistors will get

very hot in the slip type speed controllers. The variable control speed resistor (Wire wound) that use a sliding blade, are electrical

altering the length of the resistor wire, so this type of speed control does not heat up like the others. When driving in the low or 2nd speed the ceramic resistors will get very hot

4. WHEN THE CAR DOES NOT TURN

1. Does the steering servo operate properly? If not, the wiring from the receiver to the steering servo may be disconnected

2. Remove the steering servo. If it operates normally, the servo horn or the servo rod may be rubbing against something. Also, it is possible that the king pins of the front wheels do not move smoothly

3. When the car does not take corners well refer to 1 and 2 on the page of 'Building a High Performance Car'

5. WHEN A CAR DOES NOT TURN

1. Do the speed control switch and the neutral servo stop in the neutral position? If not, adjust it with the trim lever on the transmitter. After the adjustment, if the car runs at high speed even though the switch is in the stop position, the switching servo or the servo rod may be rubbing improperly. Correct them referring to 1 in 'When the Car Does Not Gain Speed'

2. Excessive play in the connection between the switching servo and the speed control switch may cause the switch to fail to return to the stop position even after the servo is at the neutral position

6. IF THE RADIO CONTROL DOES NOT OPERATE

1. If the batteries of the transmitter or receiver are low, the radio control will not operate. Replace it with new batteries

2. Are the antennas of the transmitter and receiver ok? The following actions make the reception of radio signals poor: shortening the receiver antenna wire, winding the wire around the antenna tube, securing the wire inside the model car, or removing



The insulation of the wire

1. Make sure that metal parts of the car do not rub together under vibration. Rubbing between metal parts will sometimes generate radio noise which disturbs radio control

2. Hold the transmitter away from the car with the control stick in the neutral position. If the servos are glitching it is most likely caused by radio interference



CHARACTERIZING A CAR

There are a variety of car characters: fast cars, cars with excellent acceleration, cars with good cornering capability and so forth. Cars assembled from kits come out diversified in quality because they are built up through the assembler's own techniques. Build your car in your own way. The most apparent characterizations are formed in the gear ratio and the steering characteristics.

1. MAXIMUM SPEED AND ACCELERATION CAPABILITIES (GEAR RATIO AND SPEED)

At a given output power of the motor the maximum speed and acceleration capabilities are determined by the gear ratio. With electric cars, the relationship between the pinion gear on the motor shaft to the gear of the rear axle is important. You will have a higher gear ratio with a smaller pinion gear (smaller number of teeth) and a larger gear on the rear axle. The opposite makes a low gear ratio. With a high gear ratio, the car has a better acceleration capability but a limited maximum speed. A car with a low gear ratio has poor acceleration but a high maximum speed.

A car with high gear ratio is suitable for a technical course which is built with hair pin curves demanding low speed driving, while a car with a low gear ratio is for a speed course consisting of longer straightaways and curves of longer radii.



TIRES

The diameter of the drive tires is also related to the speed and acceleration characteristics. The larger the diameter of the drive tires is, the higher the speed of the car will develop within certain limitations.

2. UNDER STEERING AND OVER STEERING (STEERING TENDENCY)

When the steering wheel is turned, the car will also turn in the same direction. However, most cars have the tendency to turn excessively or inadequately. These characteristics are called steering traits. Cars that turn excessively have over steering traits

and the others have under steering traits. Cars that turn in close proportion to the control have neutral steering. This is hardly achieved except with cars that are running at a low speed.

STEERING WHICH IS EASY TO CONTROL

A car with slight under steering is easy to drive. A car with over steering will wander when taking corners at a high speed. Even on a straight course, it is unstable. An under steering car has difficulty making sharp turns, and at a high speed it may not be able to take corners and could leave the course. In either case, excessive steering makes a car difficult to control.

FACTORS TO DETERMINE STEERING CHARACTERISTICS

The steering characteristics are affected by the difference between the friction of the front and rear tires. When the friction of the front tires is greater than that of the rear tires, the result is over steering. The opposite condition causes under steering. Therefore, adjust the traction of the rear tires so that it is a little greater. You will then attain a slight degree of under steering.

The traction of a tire is determined by the weight it carries, by the area of contact of the tire on the road surface, and by the softness of the tire surface. The heavier the weight a tire carries, the larger the contact area becomes, and the softer a tire is, the greater the traction becomes with certain limitations.

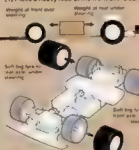
ADJUSTMENT OF STEERING CHARACTERISTICS

• DECREASING OVER STEERING

- (1) Place a heavy load, such as batteries at rear portion of the car.
- (2) Replace the rear tires with larger ones or replace the front tires with smaller ones.
- (3) Replace only the rear tires with sponge tires.

• DECREASING UNDER STEERING

- (1) Place a heavy load at the front of the car.



(2) install front tires that are larger

- (3) Replace only the front tires with sponge tires.
- These three remedies are the basic ways to change steering characteristics. The traction of cars with suspension systems can be increased by decreasing suspension spring tension. 30%-40% of the car's full weight should be on the front wheels and 60%-70% on the rear wheels.

WING

The wing attached on many racing cars is employed to gain stability at high speed running. With your radio controlled cars, the rear wing is used to press down the rear wheels for improving the traction on the road. In this way the gripping power of the rear wheel becomes greater than that of the front wheels.



and the steering trail changes toward under steering. The faster the car goes, the more effective the wing becomes, that is, the greater the down thrust on the rear wheels. Depending upon the way you adjust the wing, the car can have an excellent cornering character on a low speed curve, but still keep speed stable on the high speed straight. Such a car, also, will show a good adherence to the road at high speed running. The effect of the wing is lessened when the wing is flattened. The more it is lifted, the greater the down force. However, it increases the air drag, too, and the velocity of the car slowed. Therefore, the adjustment of the wing must be made carefully, and with the proper adjustment an ideal maneuverability will be attained.



SUMMARY OF CAR CHARACTERISTICS

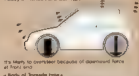
Before you become familiar with controlling techniques, it is recommended to keep the car under steering. (Refer to How to Turn 1 Adjustment of toe-in and toe-out.) Along with steering characteristics, these adjustments interact closely. Test your car in various ways and find out the good control steering characteristic for most control.

REPLACEMENT OF BODY

● How to attach body

The character of a model can be altered completely by changing its body. Generally, passenger type cars such as the Renault or Ford will tend to oversteer, due to the air pressure on the front of the body while running. The Tornado and Porsche 956 are likely to understeer due to the air pressure forcing down the rear of the car, making the front end lighter. There is no way that anyone can recommend a particular type of body for your use, as driving techniques and road surface conditions vary so much, however, if you experiment a little you can find the best styling for your driving. Another advantage to having more than one body is that you can enter into different classes of racing, using the same basic chassis, but with a different body. Practice with different bodies to see which is best for your driving techniques.

• Body of Renault and Ford type



• Body of Tornado type



• Body of F1 and F2 type



• Renault and Ford type



• F2 type



• F1 type

ENJOYMENT OF IMPROVING PERFORMANCE

If you attain proficiency in controlling it, you will be tempted to improve your car. This chapter will introduce handy ways to increase performance. The most important matter you have to keep in mind when you modify your car is to keep everything in balance. By putting a big motor on your car, you can make it run faster. Still it might not be an improvement of performance if it has lost stability. Most kits on the market are produced by the manufacturer with all factors considered such as speed, maneuverability and durability. So try to achieve the collective performance of your car.

UTILIZING AVAILABLE PARTS FOR IMPROVEMENT

The car kits have optional turn up parts available on the market, such as more powerful motors, differentials and ball bearings. As an example, changing the RS-640 motor for the more powerful RS-644 will greatly increase the speed of your model. Ball bearings are very effective in reducing the rotating friction of axles and wheels, allowing more motor power to the driving wheels. On racing cars it is good advice to replace the rubber line semi-suspension lines to spring lines for better handling. Different sponge tires are available for racing needs. For the front wheels, special tires are available, which will improve the straight turning ability and corner simultaneously.

ADOPTING PARTS MADE FOR OTHER KITS

You can also adopt repair and tune up parts from other vehicles to your own vehicle. For example, the Tamiya Ford C100 Racing Master 4-Kit RS633 includes the RS-640 motor but replacement to the more powerful RS-644 is possible. Motor can be made without any modifications at all. A speed controller without a fuse in the circuit doesn't allow the use of a motor battery as a receiver battery also, thereby lightening overall weight. If you replace speed controller to one with a diode, you can then use the 7.2V battery for both power and safety. By adding the Tomado Racing Master M3, 3.56321 mechanism disk and differential unit to the Ford C100, it will have changed the front to spongy tires.



Similar performance to the Tomado Select is according to the road surface, and tune your vehicle with the many parts available. You will be amazed at how much of an improvement in performance you can obtain with a little effort and expenditure of funds.

3 UTILIZATION OF PARTS OF OTHER KINDS OF MODELS AND EVERYDAY LIFE COMPONENTS

Many sorts of parts are available on the market. Some of these parts can be used on model cars. For instance, a type of push rod connecting servo horns and control units in a model are sold which have threaded ends and easy to adjust length. Also, a velcro pad with one-sided adhesive may be used for binding the wiring and installing car bodies, etc. So these items of other crafts, besides model building and components of daily necessities can be of good use for your radio controlled electric model cars.

4 LIGHTENING WEIGHT

Lightening the weight of a model car is another effective way to enhance the performance. Cutting off part of chassis and gearbox case is often done. Also the window shield is made of thin 0.2 mm transparent plastic plate or only 1 battery unit supplies energy to both the radio control receiver and the drive motor is employed. But radio controlled cars are subject to shocks from road surfaces while running and to the impact of collisions. So the car must be very sturdy built.

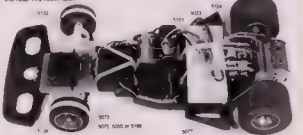
5 SUPPLEMENTARY OF BATTERY POWER AND REMODELING MOTOR

By increasing the number of batteries, improvement of performance can be certainly achieved. However, this must be done very carefully because the motor and the switch may be overstrained. Rewinding a motor armature with thicker wire makes a motor rotate faster, but it will draw more current. Also, lifting up the gap between the armature and the magnets amplifies the torque. This can be done by inserting 2 or 3 sheets of cellophane in the place. Nevertheless, the motor is such a precision made item that these renovations may decrease performances or deteriorate the durability of the motor. Also chances are in many official racing events that the maximum voltage is placed under restriction, sometimes rewinding the motor is prohibited at all.

1/10 FERRARI 3073



1/10 RALT RT2 HART 620R



1/12 FORD C100 (RAC)



1/16 SUBARU BRAT



Racing Speed Controller (5172)



By using a terminal of silver alloy, the speed controller will transmit the battery power to the motor with little current loss, providing very high performance. It has three forward speed steps and one reverse. The top speed in the low and 2nd steps are adjustable as well as the braking force. For slippery road surfaces, a slow acceleration and soft braking are desired. By installing a diode, the 7.2V battery used for motor supply voltage, can also be used as the receiver battery, thereby saving weight in the vehicle.

PRECISION BALL BEARINGS



Ball bearings are a must for increasing the performance of all radio controlled cars by reducing friction. Ball bearings used on the front axle boost cornering capability. At the same time, they help to prolong the battery life since the loss of energy decreases considerably. Ball bearings can be used for the Porsche 935 when installed with the semi-pneumatic front tires A.

DIPLOTYPE SET



These toys are the result of a new idea. The center portion of the tire is of rubber sandwiched in between sides of sponge. It accomplishes both excellent stability on the straight and superb cornering capability. Beginning with the Countach Competition Special it can be fitted to all other Tyrreco radio control cars. The set contains 2 tires, 2 wheels, other bearing parts. The wheels are designed to accept ball bearings, available on

the market as *colaptes auratus*.



The front axle affects the control of the car more than you may think. For gaining stability in straight travel the traction force of the front wheels should be reduced. However, the anti-lock understanding of bends is severely affected. The car will lose its stability on the wheels, sharp turns at bends can be achieved but on the straight the car will lose stability and with a little turn of the steering wheel will weave and zigzag. Diplo tires are the answer to this problem. On a straight track the center portion of the tire is made of a soft rubber compound and stable running is achieved the side sponge section of the tire which has better gripping characteristics, will be in contact with the ground and will make sharp turns. The diplo tires are produced to utilize the difference between the flexibility traits of rubber and sponge. They have been a new enjoyment model car drive.

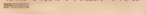
SPONGE TYRE

5MM SPONGE TIRE REAR-G (SOFT)
Sponge tire is of soft material and displays excellent road grip. Width is 35mm and dia. is 52mm. The set includes two tires and two wheels. The tire can be used as spare tire for Tornado (5832), Ford C100 (5833), for Goli (5825) and Renault (5826). Together with 5088 Bushing Set, it can be employed on the Countach CS (5808). Tires with good road grip will enhance the cornering ability and on the rear will transmit power to road surface without loss and enhance accelerator ability.

F.R.P.

5108, 5123, 5124 ERP CHASSIS

As the spots of electric PVC cars become faster, more use is made of FRP chassis than to its high strength and resistance to sudden shocks. FRP stands for Fibre Glass Reinforced Plastic and it is very light in weight. It is used in the chassis of many of the full sized vehicles where weight and strength are required. The moderate flexing of the FRP chassis adds a great deal of stability to fast running because of its ability to absorb and dampen out small shocks on the roadway. Tamiya produces three types of chassis for the 1/10 scale model cars. These parts These chassis were originally contained in the kits for Tamiya's F1 machines, the Couchack LP500 and Celica XB turbines, and F2 machines. Each is 2mm in thickness and come pre cut and machined, ready for use in your own car. They can also be used as building up your own race car, or used as replacement parts for the above mentioned



MABUCHI MOTOR

© 2000 Blackwell Science Ltd *Journal of Internal Medicine* 247: 391–397

These two motors are the most widely used electric motors in the R/C field. The RS-380 motor is smaller, lighter and has a smaller current consumption than the RS-540. A car equipped with the RS-380 motor can run up



$C_e = 7\mu$ +PS-MC + Normal voltage +PS-5A0 $R_s = 7.2\Omega$
 700pF Normal 200pF 700pF
 (1,500 RPM) Speed at normal voltage and load 2,500 RPM
 2.5A Current at normal voltage and load 0.5A

to 30 minutes with one full charge of the Ni-Cd battery and the car will be more easily controlled due to the slower speed provided. The RS-540 motor is much more powerful and, of course, the running time will be less due to its higher current drain. When you can handle a car with the RS-540 motor, it is said that you are in the middle class of RC drivers.

RS-540D Black Motor Series

www.elsevier.com/locate/jmb

These high performance motors were developed for competition running. The physical size is the same as the RS-540. They are designed to rotate in one direction and the sprint motor will draw the most current for faster acceleration and shorter running time with stress being placed on high RPM. About 5 minutes running is available. The Endurance motor was developed for the 8 minute races and its power and RPM has been balanced to meet this time frame. Performance is between that of the RS-540 and The RS-540SD. **Black Motor Sound**



SILICONE INSULATED WIRE

This is a large current flow wire for use with Ni-Cd batteries. It consists of 308 0.08 dia copper wires, twisted into a large cross section to offer the least resistance to the flow of current from the battery to the motor. It is covered with a thick coat of heavy duty silicon rubber to remain flexible and easy to wire up.

ADJUSTABLE RACING SHOCKS

A damper stops or diminishes rebound from coil springs and also reduces the inherent tremor of the springs, allowing the tires to obtain a better grip on the surface. Adjustable oil dampers as used on the racing vehicles are the same as those used on full-sized cars and function in the same manner. When used in conjunction with normal coil spring suspension systems, the performance improvement of the vehicle is amazing. Shock dampers are available for most of the famous RC vehicles and are normally direct replacement parts, easy to install and maintain.



1981 Adventure Hiking Shorts • Sundries 1.49 • Socks 1.00
from Lerner's. Buy from The Book Dept. The Greenhouse Book

DIRECTLY CONNECTED SERVO SAVER

The servo protects the internal gears of the servo from breakage due to sudden shocks and overcurrent stoppage from road surface rocks and/or collisions. The directly attached servo saver as the name implies, is connected directly to the output shaft of the servo. It is light in weight, saves space and is strong and practical. Used in conjunction with the steering servo, it provides positive steering control while also protecting the servo from damage. Use it with the special roll-end set 1440.

308 Directly Connected Servo Motor • Suitable for a 7hp and 254 to 70-90hp 350 (3542) • The following list can be graduated by using the 5056 Ball Link & Adjuster Rod Set or 5056 Ball Link & Adjuster Rod Set.

RUBBER BAG SET

It's impossible to avoid the dust, dirt and moisture when operating an off-road vehicle. These rubber bags will protect your valuable equipment from these elements by covering its components with a strong, but light seal—a balloon type of cover. They are easy to install or remove, and can be used over and over and from one vehicle to another if necessary. The protruding wiring can be sealed with licop compound, vinyl beads or straps.

POWER SOURCE

ry cell batteries are not powerful enough to enable you to get full enjoyment from radio controlled cars and tanks. We recommend that you use a rechargeable nickel cadmium battery or seal cell battery. The Tamiya Ni-Cd Battery packs are ideally used for powering electric radio controlled models. For radio controlled tanks, the Tamiya Sealed Battery is the most appropriate. Both batteries are rechargeable and therefore more economical.

TAMIYA Ni-Cd
BATTERY 6V 1200mAh
6V 400mAh
7.2V 1200mAh



AMIYA NI-CD BATTERY

These batteries were developed for power-g Tamiya radio-controlled models in cooperation with the Sanyo Electric Co. Ltd. They are high performance rechargeable batteries consisting of 5 or 6 nickel cadmium cells connected in series to produce 6V or 7.2V and are packaged in a durable plastic case for ease of handling and safety. The compact rectangular case

and customized safety connector requires no extra housing or packing for installation in your model. Being rechargeable over 300 times, they are very economical.

• regular capacity: 3 hours / 200mAh, 4000mAh
• Nominal voltage: 3.7V / 3.7V / 3.7V
• charging voltage: 3.7V / 3.7V / 3.7V
• standard charging current: 120mA / 400mA / 400mA
• maximum charging current: 1.2A / 1.2A / 1.2A
• standard charging time: 14 hours / 3 hours / 3 hours
• temperature range: -20°C to 60°C
• charge 0.1C to 0.1C
• long preservation: 30°C to 45°C
• Dimension: 117 x 50 x 25 mm
• weight: 117 x 50 x 25 mm
• about 305 g / 10.8 oz
• 120mAh / 320 / 104 / 37 mm about 800 g / 1.8 lb
• 400mAh / 117 / 50 / 40 mm about 370 g / 7.7 oz
• 1200mAh / 117 / 50 / 40 mm about 370 g / 7.7 oz

TAMIYA Ni-Cd
BATTERY 7.2V-1200mAh
RACING PACK



This is a light weight 7.2V 1200mAh racing battery consisting of 6 cells arranged flat to maintain a low center of gravity. Using the tabless method of current collection the battery can be utilized with those powerful motors requiring large current flows. Size is 46 x 130 x 24mm and weighs only 320g. Tamiya Ni-Cd quick charger or the standard trickle charger can be used. Designed for use in the Tamiya Tornado, Ford C100 and Racing Master vehicles. By employing this battery in your competition racing car your machine will have greater running performance and maneuverability.

• Nominal capacity @ 10 hours: 1200mAh • Average voltage = 7.2V • Final discharge voltage = 6.2V • Standard charging current: 1200mA • Standard charging time = 14h18 • Maximum discharge current = 4.8A • Temperature range = discharge: 20°C to -60°C Charge 0°C to +65°C Long preservation: 30°C to +30°C • Operating life: 30 to 45 years • Weight: about 20g • Produced by Rayon Electric Co. Ltd.

TAMIYA Ni-Cd BATTERY QUICK CHARGER



**EXCLUSIVE QUICK
CHARGER FOR USE WITH
TAMIYA NI-CD BATTERIES**

This is an exclusive fully automatic charger designed for safety and reliability, for quick recharging of Tameya Ni-Cd batteries. The charger is powered from a

cigarette lighter socket in a car which makes it excellent for field use. The standard charging time is only fifteen minutes, short enough to recharge the battery during an interval of the races while the charging is completed, the charger automatically switches off and the pilot lamp goes out. A different circuit is incorporated and whilst charging the charger is constantly checking the state of the battery inadequate or over-charged. The battery is protected against a saturated battery cannot be damaged by continued charging. Also, the charger is designed for safety against over-heating of both charger and battery. If any extraordinary heat is generated from either the battery or the charger, an alarm will sound. Safety is very important with a quick charger, because it supplies a lot of current at a time.

The size is about 11cm x 7cm x 5.5cm, weighing only 220 grams, very compact and easy to carry. The length of the power cord is 80cm, the outlet cord 35cm—long enough to use. The pilot lamp is light while charging and go out when the charging is complete as an extra safe guard. All in all the Tammy's quick charger features a safe and prudent design for reliable and handy operation for the enjoyment of audio controlled car.

• Charge = the force is between two objects
• Force = the push or pull on an object
• Charge = the force is between two objects
• Force = the push or pull on an object

TAMIYA
SEALED
BATTERY
6V3.9Ah



TAMIYA SEALED BATTERY

The Tamiya sealed battery is a closed type wet cell battery of 6 volts 3.6 ampere-hours. Since it is sealed, you can lay it down without fear of leakage and it does not require to be replenished with water. You can recharge it about 100 times.

Tamiya Sealed Battery: 6V 3.6 Ah • Nominal capacity: 3.60 hours (at 1.0A) • Standard charging rate: 250mA/100mA/100mA • Charging time: 12 to 17 hours • Dimensions: 105mm x 71mm x 47mm • Weight: 720 gram • Produced by Tamiya Battery Co., Ltd.

**TAMIYA NI-Cd BATTERY MIN
PACK IS CONVENIENT, ECO**

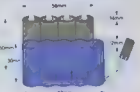
**NOMICAL AND SUITABLE
FOR GOOD PERFORMANCE**

Tamiya Ni-Cd 6V Battery Mini Pack can be used conveniently as a power source for the receiver. Its size is half that of four UMJ3 batteries and its weight is 230g. It is effective in making performance better by lightening the weight of the R/C car. Using charging wire included with the 6V Mini Pack, it can be charged easily and quickly from a Tamiya Ni-Cd 7.2V battery. In addition to a power source for R/C cars, it can be used with other R/C models.

**TAMIYA Ni-Cd
BATTERY 6V-150mAh**



• Nominal capacity: 1.5 Ah (100% DOD) • Nominal charging voltage: 6.0V • Peak discharge voltage: 5.0V • Standard charging current: 150mA • Standard charging time: 12 ~ 16 hours • Maximum discharge current: 800mA • Temperature range: discharge 20°C to +48°C, Charge 0°C to +45°C, Long preservation 30°C to +20°C • Dimensions: 40 x 30 x 19mm • Weight: about 50g • Produced by Baryo Electric Co. Ltd.
©Copyright 1999, Baryo Electric Co. Ltd.

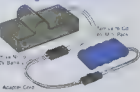


➤ The size of EV Mini Pack is a little larger than half the size of four JMD dry cells. It doesn't need a large space.



Weight of 8V Mini Pack is about 2/3 of four UM3 dry cells. It is very useful for reducing weight to make performance better.

● Charge of 6V Mini Pack



TAKE CARE IN HANDLING

The Motor, the power plant, nickel cadmium battery, source of electricity, charging to restore the energy to the batteries, and control switch, to control velocity of these are essential components for your model's dynamic running of the joys. Misuse of them, however, to unskillful assembly, could lead to dangerous overheating or to a breakdown. Therefore, you are best advised to read & understand the instruction of do's & don'ts before use.

250% more capacity than the standard 100% capacity. Recharge voltage by putting the motor in the water.

● MOTOR

There are various kinds of motor classified by size, the number of windings on a commutator, current draw etc. Each motor has proper voltage and load under which they are designed to operate as it will shorten their life greatly if they are used in a motor is hard to detect in the outside. So careful handling of a motor is advised.

Excessive voltage will shorten motor

● Motor RS-380 and RS-540 are most frequently used with the radio controlled cars. They are designed to work under 4.5 volts. The maximum permissible voltage is 5.5 volts. Excessive voltage will burn the coil in the motor and ruin it. Over load also shortens motor life. A pilot lamp in the motor is designated in the beginning in accordance with its size and the prospective voltage. Forcing to overwork will superfluous current will in the motor which will turn to heat, resulting in over-heating. In the worst case, the electric wires of the motor will be fused together, impair gear ratio, shift gear meshing, poor rotation of the wheels, these could be sources of strain on the motor. See if there is any part of the motor overheating. If so, you must shut off the cause. An over hot motor results in loss of speed, requiring more flow of electricity, and the battery will discharge sooner. It is almost impossible to use a motor which has burnt out.

● Modified motors requires more attention. You can boost up the performance of motor such as its revolutions and torque, altering the inside constituents. But it is not always the same for the same function. An research and developed for their own balanced factors, such as the output power, the velocity of rotation in relation to their durability. Therefore, an immediate change in the performance elements may make the motor less powerful or have poorer durability even when the motor's r.p.m. is improved. When you run a modified motor in your car, you should be careful not to impose a great strain on the motor than when

you are using a stock type of the motor. Chances are the conversion of a motor deteriorates the performance of the motor unless you are well qualified to do it.

● SPEED CONTROL SWITCH

Improper usage of the speed control switch will easily ruin it. Read the instruction thoroughly before use. From Tamaya, the resistor type two stepped speed control switch and the resistorless speed control switch which enables gradual speed change by employing a coil resistor.

● Ni-Cd BATTERY

The Tamaya Ni-cd battery is such a high performance power source that it is able to push out more than 30 amperes, equivalent to 200 watts. An erroneous handling of the battery may evoke overheating or melting of the electric cord or the case. Possibly the battery itself will be harmed completely.

Be sure not to be short-circuited the battery at any time.



(1) Short circuit with a lot of current will melt the cord. This is one of the most dangerous faults with the Ni-cd battery and occurs frequently. With a short circuit, a large amount of electricity will flow through the circuit in a short period of time and will generate heat. This could cause the cord to burn and the battery to melt. When the battery appears normal, the internal soldered points may melt and the wiring may be out of contact. An accident during a race may cause an extraordinary increase in the current, the motor having the same effect as a short circuit resulting in the ruin of the motor, wiring, switch or battery.

(2) Breaking of wiring is shocked in the Tamaya Ni-cd battery is packed in a hard plastic case. I am enough protect the cells from some degree of shock. However, it may be damaged by a strong impact, for example, when dropped from a high place. And although the outside case appears undamaged, the inside wiring and contacts may have broken. In either event of course, no current would flow. Pulling or tugging the electric cord is another labor as it may cause the contacts and connectors to become out of position.

(3) Water in the battery. Water which penetrates into a battery may cause a short circuit or corrode the internal wiring when the electricity flows through the wet wiring. When the contacts are corroded the internal resistance increases and the discharging characteristics dwindle. Therefore, if the battery becomes wet, stop running the car and

dry the battery thoroughly.

(4) Heat by over-charging is dangerous. Over-charging will shorten the battery life rapidly, especially so when the charger used is a quick charging type incorporating a timer. For instance, a charger with a 15 minutes timer charges about 3 amperes of current into a nickel cadmium battery during one charging cycle. In such a case, nickel and cadmium are expedited to react chemically and producing a gas at a rapid rate. If the charging is continued beyond the limit, chances are that heat is generated along with the gas and will melt the case or the wiring. So over-charging should be avoided under any circumstances. A feature of the Tamaya quick charger is to prevent this danger by a cut off circuit which detects the amount of electricity in the battery and switches off the charger automatically, assuring safety of use.

● There is almost no danger of overcharging with a charger requiring 14 to 16 hours to charge.

Although over-charging is not dangerous, you are required to be careful, because the battery may become impossible to recharge. After running your cars, make it a rule to always switch off the speed controller and disconnect the battery.

● CHARGER

It is important to have the correct charger to enable you to obtain the very best performance possible from your battery.

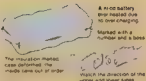
(1) Breaking of the wiring in the circuit. When a charger is knocked or potted, the pilot lamp or the internal circuit may become damaged. If the charging voltage and amperes snaps, the charger will not function properly.

(2) An overnight type charger shows a difference in voltage from 3.5 to 4.5 volts when measured between the terminals without a battery connected. This indicates the charger works correctly. In the case of a quick charger, it does not read any voltage; this is a normal condition if the pilot lamp is on.

(3) The reverse connection will break down the charger.

Most break-downs to a charger can be attributed to reverse connections. Enormous current will flow through the circuit between the charger and the battery in a moment if connected reversely. An overnight type charger especially is designed to allow a little current to flow for a long time and it will burn out in a moment if connected wrong. The Tamaya system shows that an exclusive socket is fitted to each size of battery. The charger is fitted with an equivalent exclusive plug so that only the correct charger may be used on that battery.

With the quick charger in exclusive use for the Tamaya Ni-Cd battery you are required to watch not only the direction of the connectors, but also polarity of the 12 volt power source. If the polarity is wrong, it will cause the battery to burn inside and become useless.



(3) Other don'ts.

A specific length of cord (produced with a designated resistance value) is used on the input side of the quick charger for the Ni-cd battery. This cord should not be cut, otherwise the resistance value varies and the cord will heat or melt. Also, do not attach any connector or clip anywhere on the cord. When a cigarette lighter of a car is not used as the power source, a car cigarette lighter socket available on the market should still be used. Watch the polarity.

When a transformer from 100 or 200 volts down to 12 volts is used as the power source instead of a car cigarette lighter, though it is not recommended, the capacity of the transformer has to be 6 to 8 amperes, or else the desired charging cannot be performed.

MAINTENANCE MATERIALS

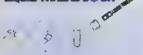
Tamaya Spray Oil is an oil which utilizes a molecular chemical compound formulated in the U.S.A. which has proved effective as a long lasting lubricant. As it has strong permeability, spraying on bearings, within gear boxes, moving shafts and suspension parts, it will provide a smoother and less friction operation of all moving parts. It will also displace moisture and ensure longer rust free operation than normal penetrating lubricants. It is indispensable when operating R/C cars.

TAMIYA SPRAY OIL



After your cars have been running in the rain or through puddles, spray Tamaya Spray Oil onto the chassis or other metal surfaces. This will penetrate between the water and the metal surface to form a layer which helps to dry up the surface and also protects the metal from rusting. Since it has a cleansing function, the spray promotes the conductive power of electricity and guards the contacts of a receiver against abrasion. This is a must for maintaining your radio controlled models.

LIQUID THREAD LOCK



LIQUID THREAD LOCK

It is essential that this liquid thread lock be applied to a nut and screws when the model is assembled. This liquid is not a glue, but a securing agent. It will prevent screws from working loose, which will happen if it is not used. It is very effective and easy to use. At any time, screws can be loosened or removed for maintenance or repairs by using about twice the force required when they were originally tightened.



SILICONE SEALANT

Apply the silicone sealant to all areas where the instruction manual says. Apply it with your finger and smooth it out. It will harden into a rubber like material over night, and protect the gears and bearings from dust and moisture, plus retain the oil and grease applied during assembly. If more is required, it can be purchased from your nearest hobby supply house.

PAINT MARKER

EXCITE NEW RELEASE F.N.S.H. MODELS OF PLASTIC AND OTHER MED. LMS.

Easy and professional results can now be yours with Tamaya's new paint markers. Use it as you would a marking pen. Enamel paint formulated for the painting of plastics. Even the unskilled painter can now achieve beautiful results on their models. For the expert modeler, it is indispensable for detail painting and time saving. Excellent for wood, metal, glass as well as on all plastics. Shake paint marker well first, then push tip against a firm surface to break seal and start point flow. Tamaya's paint marker ensures you of safe, easy painting without brushes and messy cleanup.

CEMENT PEN

NEW HANDY TYPE

Press the tip down right on the model, the cement will flow out freely. After use cap the tip.

A new, safe, easy to use product.

DELICATE TOUCH

Narrow tip for clear application & greater sensitivity.

No cement overflow. You figurines, bikes & tanks will look all the better.

ECONOMICAL

Trail of cement to each pen, no waste or loss through dryout. No cement to mix & scale like etc.

Why not give it a try?

PAINTING OF RC CAR BODIES

A large part of the enjoyment of RC cars is in the construction and running of the vehicle. However, the final finishing and painting can also provide great pleasure. The clear bodies of polycarbonate (LEXAN) offer the greatest challenge in painting to most modelers because they are not familiar with the methods of painting these types of bodies. There are two types of bodies available for RC vehicles. The highly detailed and true to life looking bodies are made from styrol resin and are injected molded. They are heavier and can be damaged during hard accidents on the track. Polycarbonate is thin, light and almost damage proof, but not as detailed as the styrol and is vacuum formed.

SOME HINTS ON PAINTING

If you have a choice, paint on a clear day with little humidity. Painting on a damp day will leave the finish cloudy or milky due to "blushing".

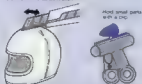
- Ventilate the painting area by opening a window.
- Never paint near an open flame.
- Spray paint outdoors in a windless area.



PAINTING OF INJECTED MOLDED BODIES

These bodies are made from shock resistant styrol and are from the same basic material of plastic models. Suitable paints are the Tamaya acrylics, Paint markers or other paints for plastics.

You must remove all dust and oil from the surface of the plastic by washing it well with a kitchen detergent, then rinsing it off with clear water and drying thoroughly. All of the parts that are to be painted in the same color are cleaned up, sorted and sorted with the edge of a white trade cloth then with fine abrasive paper.



gathered together in one place. Joint and seam lines are cleaned up with a modeling

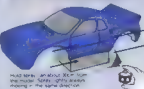
knife and sanded down with very fine finishing paper. Hide the small parts by painting with a spray chip. If spray painting, set the parts on a box or stand to make it easy.

Q2 When painting many colors. When you are adding stripes or doing different contrast colors, masking of the area is vital. Use only a high grade of paper masking tape, not the masking tape used for full sized vehicle painting. Fixmat paper and shop tape is available from good hobby papers and art stores. Remember the golden rule of painting outside surfaces. Always paint the light colors first. Then go on to the darker colors. Mask small areas at a time. When doing a large area, cover it with newspaper, masking the edges of the paper with tape. When done, place the tape into position, then draw in the curve with pencil, cut and remove the unwanted areas of tape with a modeling knife. Press the edges of the masking tape down firmly with your finger or toothpick.



Cut areas unwanted areas of the tape with a sharp knife to form patterns and curves.

Q3 Painting. For finishing large areas, spraying is easier and the results are better. Remember to use the light colors first, then on to the darker shades. Remove any masking just prior to the paint becoming completely dry. Add any detail painting and the driver figure. Polishing with a compound will add a high gloss finish.



Spray painting hints

• Spray paint about 30cm from the model.

• Spray a light coat for good paint adhesion. It will dry faster and you can add another coat in a few minutes.

• When the distance between coat and model is too close, or you try to do a thick coat, it dries quickly, you will get runs, and the paint will not adhere to the plastic properly.

Brush painting hints

- Select the brush according to the job. Use a wide flat brush for large areas, and a fine, pointed brush for detail work.
- Paint only in one direction. Never back and forth like a house painter.
- Don't be concerned about blotches or runs.

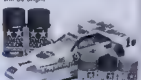
at this time. Leave them and repaint the area after it is completely dry.

Cautions when overspraying

Accept the fact that you must not overspray acrylics and enamels with lacquers. It is perfectly acceptable and its doing by the professionals to use different paints to achieve different effects. When spraying or brushing lacquers over enamels and acrylics the solvents in the lacquer will melt and distort other paints. Painting over lacquers is no problem. Use light coats for good adhesion and proper coverage. Do not try and complete the job with one coat of paint. Even when you are using the same paints, it is possible to apply a thick coat over one first coat. Then and up masking the undercoat. Overspray quickly and lightly, using the same type of paint.

Some practical advice

Bright colors, such as red, yellow and white, do not look good if painted over a dark color such as blue or black. Paint the surface first in flat white, then the finished red, yellow etc. will be bright.



Painting polycarbonate bodies (LEXAN)

Lightness and toughness are features of polycarbonate bodies. Special paints are required for finishing these bodies. Normal plastic paints and lacquers will peel or chip off even with the slightest shock to the body so it is necessary to utilize polycarbonate paints especially formulated for this purpose.

Q1 Preparation. Cut off the extra portions of the body using a sharp knife, by scrubbing in one stroke, on the parting line. Bend the excess away from the scribed line and it will snap or tear off perfectly. Use only a very sharp knife for scrubbing. A dull knife causes more injuries than you can imagine. After firming the body to the required shape, sand off the edges smoothly and all of the inside surfaces (except the window areas) with 400 grit finishing paper. This will provide a good base for the paint. Then sand, wash the entire body with detergent, rinse and let dry.



Q2 Masking. As in painting styrol bodies, masking is necessary when using more than one color. As painting will be done on the inside sur-

faces, it is done in reverse. Paint all the details first (Window frames, driver figure engine etc.). Paint the darker colors first, followed by the lighter ones. If spray painting also, you must mask off the entire outside of the body to prevent any overspray from marring the surface.

Paint small details first. (Window, panel lines etc.)



Paint dark colors first, followed by lighter colors.

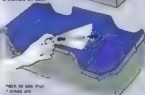


3) Painting to paint is applied from the inside, but view it from the outside, the first coat (details) must appear as the outer most color when coating all the finished model. You must consider the order of your painting to achieve this effect, and as it is applied just the opposite from painting styrol models, you have to be thinking about it all the time.

4) Mask all windows and the outside of body completely.



5) Spray from a distance of 30cm.



6) Hold the spray can about 30cm away from the body and spray the same as when doing styrol bodies. Check from the outside to make sure that you have covered all areas required the painted surface is green, let it dry and correct if later with an additional coat. When several coats are to be applied, let each dry thoroughly before applying another coat.

● Hints

When the polycarbonate paint had dried it has a very strong film surface and the masking tape will tend to pull away the painted parts on the model. The masking tape should be removed prior to the paint drying completely. If the paint starts to peel away from the body while removing the masking tape, take a sharp knife and run the tip along the tape edge to free it from the painted surface, and it will then come off cleanly without removing the paint from the surface.

● Hints for finishing

Until the latter half of the 1980s, the racing cars at the International Races were painted in National Racing Colors which were designated for each country. However, lately they are painted in colors representing the image of sponsoring companies or the design of the merchandise package. Among the well known are the Marlboro stripes in red, blue and navy blue, a design from a cigarette pack in the black and yellow of the JPS Lotus, red and white of the Marlboro McLaren. Think out your own design, assuming you were a sponsor of him.

The following is a list of some National Colors

Japan	2 tones Red and White
Green	
USA	2 tones Blue and White
Italy	Blue
France	Silver
Germany	Stripes of Blue and Silver
Austria	Yellow
Belgium	

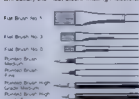
THE BODY MARKER FOR PREPARATION PRIOR TO PAINTING

The decoration and finishing of PVC car bodies is not only satisfying, but also an essential part of the construction of radio control models. A beautifully finished car seems to run faster than the others and if it is an original or remodeled vehicle, it will stand out conspicuously. Tamiya has made available almost all of the finishing material needed to produce a highly realistic model. They are of the highest quality, easy to use, and available from your local hobby supply house. Modeling brushes for painting supplies for repair, epoxies for remodeling compounds for preparation of the plastics and applying the final gloss. These, and other Tamiya materials will assist you in producing a Tamiya masterpiece for your enjoyment.

● For brush painting

TAMIYA MODELING BRUSHES
Tamiya produces 12 brush modeling paint brushes. They fit the hand easily and are easy to control when painting. 3 flat brushes for larger painting areas. Number 5 has a width of 15mm. Number 3 a width of 8mm and Number 2 a width of 6mm. Four pointed detail brushes are also available. Two from high grade horse hair and two extremely fine brushes from high grade weasel hair. These brushes

will satisfy the most discriminating modelers.



● For preparation prior to painting

TAMIYA FINISHING ABRASIVES

This is a new (no) resistant wet or dry finishing paper. These types of abrasive papers are necessary for preparation of polycarbonate bodies prior to painting and also for sanding down to final shape any molded surfaces that have been modified with putty. They are also useful for keeping the speed control clean and polished, for better control. A medium grade set is available for wood finishing and a Fine Grade set for plastics and metals.



Medium set #200, #300 two sheets each and one sheet of #400
Fine set #400, #600 two sheets each and one sheet of #800

● Making small parts

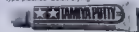
This is a two part putty that can be formed just like clay. Knead the two equal length putty parts together with your fingers. It will begin to harden in about an hour and will be completely cured in 12 hours. It can be carved with a modeling knife and sanded to final shape with finishing abrasives. It is useful for remodeling and repairing plastic models.



● For filling holes and hiding seams

TAMIYA PUTTY

This is a soft, paste type of putty useful for filling holes and seam lines. It has low shrinkage and excellent adhesion on styrol type plastics. Quick drying!



● For original body construction

PLA-PLATE (WHITE) AND (TRANSPARENT)
These are sheets of styrol resin in the B4 size format. All plastic model cement and paints can be used. This plastic sheeting is excellent for modifications, repairs and original body construction. Two set sizes are available: Pla-plate (White) 1.2mm, 0.5mm, 0.3mm 5 sheets each.
Pla-plate (Transparent) 1.7mm, 0.5mm, 0.2mm 5 sheets each

● Modifications and repairs in conjunction with Pla-plate

































PLASTIC BEAMS, ROUND AND SQUARE
These are beams of styrol resin in square and round cross section. Compatible with the Pla-plate plastic sheets, these beams are easy to work with and can be used with repairs and modifications of bodies and framework. The material is easy to form, cut and bend for complex curves and will retain its shape after forming.

Plastic Beams, Square
#2mm, 3mm, 5mm (Length 40cm)
Plastic Beams, Round
#2mm, 3mm, 5mm (Length 40cm)

● For a hand rubbed finish! TAMIYA RUBBING/POLISHING COMPOUND



Nothing looks quite as good as a hand rubbed painted finish, so Tamiya has added a rubbing and polishing compound to the growing line of finishing products. Rub over a rough surface will leave the finish smooth, so preparation prior to painting is very important. With this rubbing compound you can prepare the surface for painting quickly and easily. The compound is made of fine particles of ultra-fine suspended in a cream. It is good for removing pitting lines on the plastic, finishing up pulled areas or correcting and eliminating gluing joints. Fine scratches and blemishes on clear plastic parts, such as windshields and aircraft canopies, can be completely removed. It is also useful for polishing metal parts and will even remove rust and oxidation coatings. A deep and beautiful finish can be achieved on painted surfaces. Each tube contains 20g of this special polishing/rubbing compound. For removing paint nubs, finishing off pulled areas or correcting glue seams, first remove the excess with a modeling knife, then sand the area down to the surface with #600 grit paper. Apply a small amount of compound to a clean cotton cloth and polish the sanded surface until it's glass smooth. Remove excess compound with another clean cloth. Compound trapped in hollows or panel lines can be removed by dipping into water and running a wooden toothpick down the area. Use for polishing out the surfaces of lacquer painted parts or adding a deep gloss to acrylics. *NOTE: Not recommended for use on Tamiya Plasti Marker finishes.

<p>5201 NATA MUT D PCU</p> 	<p>5204 DIRECTOR CONNECTED HYDRO TOWER</p> 	<p>5205 SUPERHEATING GEAR SET BAG, PLUG, LENS</p> 	<p>5207 HALF SHAFT SET</p> 	<p>5208 GUY BUMPER</p> 	<p>5209 GRASSHOPPER SPEED CONTROL SET</p> 	<p>5211 CERAMIC RESISTORS 2700 (TENSUAL)</p> 
<p>5212 CERAMIC RESISTORS CHINA (TENSUAL)</p> 	<p>5214 100 SPEED CONTROLLER</p> 	<p>5215 700 BUSH SHAFT</p> 	<p>5216 BLUE WEB MOUND SPRINGER</p> 	<p>5217 BUSH SHAFT PAIR SPRINGER</p> 		
<p>5218 SPONGE TIRE SET TWO-ONE-ONE WITH WHEEL</p> 	<p>5219 SPONGE TIRE SET SEAL-A-T WITH WHEEL</p> 	<p>5227 SPONGE TIRE SET SEAL-A-T WITH WHEEL</p> 	<p>5228 SPONGE TIRE SET SEAL-A-T WITH WHEEL</p> 	<p>5229 CHESTNUT SPUR TIRE SET</p> 	<p>5230 RUBBER TIRE SET PRO-L-A WITH WHEEL</p> 	<p>5231 SPEDO TIRE SET TWO-ONE-ONE WITH WHEEL</p> 
<p>5232 SPONGE TIRE SET SEAL-A-T WITH WHEEL</p> 	<p>5233 RUBBER TIRE SET SEAL-A-T WITH WHEEL</p> 	<p>5234 SPONGE TIRE SEAL-A-T WITH WHEEL</p> 	<p>5235 ROUGH RIDER SPIN TIRE TWO-ONE-ONE WITH WHEEL</p> 	<p>5236 ROUGH RIDER SPIN TIRE SEAL WITH WHEEL</p> 	<p>5237 SAND SCORCHER SPIN TIRE TWO-ONE-ONE WITH WHEEL</p> 	<p>5238 SAND SCORCHER SPIN TIRE SEAL WITH WHEEL</p> 
<p>5239 SPONGE TIRE SET PRO-C-A WITH WHEEL</p> 	<p>5240 SPONGE TIRE SET SEAL-A-T WITH WHEEL</p> 	<p>5241 ANKLED SPONGE TIRE PRO-C-A WITH WHEEL</p> 	<p>5242 HOOKING BUCKLE SPIN TIRE TWO-ONE-ONE WITH WHEEL</p> 	<p>5243 HOOKING BUCKLE SPIN TIRE SEAL WITH WHEEL</p> 	<p>5244 FORD BANGER TIRE WITH WHEEL</p> 	<p>5245 TOYOTA 400 PICKUP TIRE SPIN WITH WHEEL</p> 
<p>5246 BRAZING BLAZER SPIN TIRE SET</p> 	<p>5247 SPONGE TIRE FRONT-C</p> 	<p>5248 SPONGE TIRE (SEAL-A-T)</p> 	<p>5249 WILD WALL TIRE</p> 	<p>5250 BUGGY SPIN TIRE SET</p> 	<p>5251 BUGGY SPONGE TIRE (SEAL)</p> 	<p>5252 SPONGE TIRE FRONT-L</p> 
<p>5253 SPONGE TIRE (SEAL)</p> 						

[illegible]

R/C SPARE PARTS

[illegible]

R/C SPARE PARTS

[illegible]

POWER SCIENCE

SP			
SP-1	% Positive	4	
SP-2	% in Bacteria	5	
SP	% in the different Bacteria		
SP-3	% of Bacteria	7	% of Bacteria
SP-4	% of Bacteria	8	% of Bacteria
SP-5	% of Bacteria	9	% of Bacteria
SP-6	% of Bacteria	10	% of Bacteria
SP-7	% of Bacteria	11	% of Bacteria
SP-8	% of Bacteria	12	% of Bacteria
SP-9	% of Bacteria	13	% of Bacteria
SP-10	% of Bacteria	14	% of Bacteria
SP-11	% of Bacteria	15	% of Bacteria
SP-12	% of Bacteria	16	% of Bacteria
SP-13	% of Bacteria	17	% of Bacteria
SP-14	% of Bacteria	18	% of Bacteria
SP-15	% of Bacteria	19	% of Bacteria
SP-16	% of Bacteria	20	% of Bacteria
SP-17	% of Bacteria	21	% of Bacteria
SP-18	% of Bacteria	22	% of Bacteria
SP-19	% of Bacteria	23	% of Bacteria
SP-20	% of Bacteria	24	% of Bacteria
SP-21	% of Bacteria	25	% of Bacteria
SP-22	% of Bacteria	26	% of Bacteria
SP-23	% of Bacteria	27	% of Bacteria
SP-24	% of Bacteria	28	% of Bacteria
SP-25	% of Bacteria	29	% of Bacteria
SP-26	% of Bacteria	30	% of Bacteria
SP-27	% of Bacteria	31	% of Bacteria
SP-28	% of Bacteria	32	% of Bacteria
SP-29	% of Bacteria	33	% of Bacteria
SP-30	% of Bacteria	34	% of Bacteria
SP-31	% of Bacteria	35	% of Bacteria
SP-32	% of Bacteria	36	% of Bacteria
SP-33	% of Bacteria	37	% of Bacteria
SP-34	% of Bacteria	38	% of Bacteria
SP-35	% of Bacteria	39	% of Bacteria
SP-36	% of Bacteria	40	% of Bacteria
SP-37	% of Bacteria	41	% of Bacteria
SP-38	% of Bacteria	42	% of Bacteria
SP-39	% of Bacteria	43	% of Bacteria
SP-40	% of Bacteria	44	% of Bacteria
SP-41	% of Bacteria	45	% of Bacteria
SP-42	% of Bacteria	46	% of Bacteria
SP-43	% of Bacteria	47	% of Bacteria
SP-44	% of Bacteria	48	% of Bacteria
SP-45	% of Bacteria	49	% of Bacteria
SP-46	% of Bacteria	50	% of Bacteria
SP-47	% of Bacteria	51	% of Bacteria
SP-48	% of Bacteria	52	% of Bacteria
SP-49	% of Bacteria	53	% of Bacteria
SP-50	% of Bacteria	54	% of Bacteria
SP-51	% of Bacteria	55	% of Bacteria
SP-52	% of Bacteria	56	% of Bacteria
SP-53	% of Bacteria	57	% of Bacteria
SP-54	% of Bacteria	58	% of Bacteria
SP-55	% of Bacteria	59	% of Bacteria
SP-56	% of Bacteria	60	% of Bacteria
SP-57	% of Bacteria	61	% of Bacteria
SP-58	% of Bacteria	62	% of Bacteria
SP-59	% of Bacteria	63	% of Bacteria
SP-60	% of Bacteria	64	% of Bacteria
SP-61	% of Bacteria	65	% of Bacteria
SP-62	% of Bacteria	66	% of Bacteria
SP-63	% of Bacteria	67	% of Bacteria
SP-64	% of Bacteria	68	% of Bacteria
SP-65	% of Bacteria	69	% of Bacteria
SP-66	% of Bacteria	70	% of Bacteria
SP-67	% of Bacteria	71	% of Bacteria
SP-68	% of Bacteria	72	% of Bacteria
SP-69	% of Bacteria	73	% of Bacteria
SP-70	% of Bacteria	74	% of Bacteria
SP-71	% of Bacteria	75	% of Bacteria
SP-72	% of Bacteria	76	% of Bacteria
SP-73	% of Bacteria	77	% of Bacteria
SP-74	% of Bacteria	78	% of Bacteria
SP-75	% of Bacteria	79	% of Bacteria
SP-76	% of Bacteria	80	% of Bacteria
SP-77	% of Bacteria	81	% of Bacteria
SP-78	% of Bacteria	82	% of Bacteria
SP-79	% of Bacteria	83	% of Bacteria
SP-80	% of Bacteria	84	% of Bacteria
SP-81	% of Bacteria	85	% of Bacteria
SP-82	% of Bacteria	86	% of Bacteria
SP-83	% of Bacteria	87	% of Bacteria
SP-84	% of Bacteria	88	% of Bacteria
SP-85	% of Bacteria	89	% of Bacteria
SP-86	% of Bacteria	90	% of Bacteria
SP-87	% of Bacteria	91	% of Bacteria
SP-88	% of Bacteria	92	% of Bacteria
SP-89	% of Bacteria	93	% of Bacteria
SP-90	% of Bacteria	94	% of Bacteria
SP-91	% of Bacteria	95	% of Bacteria
SP-92	% of Bacteria	96	% of Bacteria
SP-93	% of Bacteria	97	% of Bacteria
SP-94	% of Bacteria	98	% of Bacteria
SP-9			

Category	Item Type	Item Name	Item Description	Item Price	Item Weight	Item Volume	Item Length	Item Width	Item Height	Item Material	Item Color	Item Finish	Item Texture	Item Shape	Item Size	Item Quantity	Item Unit	Item Status	Item Notes
1.10	Scale Radio Control Car	5815	Rough Rider																
1.10	Scale Radio Control Car	5816	Sand Scooter																
1.10	Scale Radio Control Car	5818	Top 1/10 Mini 420R																
1.10	Scale Radio Control Car	5819	Williams FW-01 Competition Special																
1.10	Scale Radio Control Car	5820	J.P.S. Lotus 79 Competition Special																
1.10	Scale Radio Control Car	5823	Holzer Buggy																
1.10	Scale Radio Control Car	5824	Sand Rover																
1.10	Scale Radio Control Car	5827	Ford F-150 Ranger XL1																
1.10	Scale Radio Control Car	5828	Toyota 4-4 Pickup																
1.10	Scale Radio Control Car	5829	4-4 Blazing Blazer																
1.10	Scale Radio Control Car	5830	Honda F-2 Competition Special																
1.10	Scale Radio Control Car	5831	Brabham BT50 Competition Special																
1.10	Scale Radio Control Car	5834	Super Champ																
1.10	Scale Radio Control Car	5835	Vine Indy																
1.10	Scale Radio Control Car	5836	Audi Quattro Rally																
1.10	Scale Radio Control Car	5837	Opel Ascona 400 Rally																
1.10	Scale Radio Control Car	5838	Subaru Brat																
1.10	Scale Radio Control Car	5839	Willys Wheeler																
1.10	Scale Radio Control Car	5840	Lancia Rally																
1.10	Scale Radio Control Car	5841	The Frog																
1.10	Scale Radio Control Car	5843	The Grasshopper																
1.10	Scale Radio Control Car	5844	Mitsubishi Pajero																
1.12	Scale Radio Control Car	5808	Lamborghini Countach LP500S Competition Special																
1.12	Scale Radio Control Car	5809	Cosco LB Turbo 50-5 Competition Special																
1.12	Scale Radio Control Car	5822	Datsun 280ZX Racing Master Mk.2																
1.12	Scale Radio Control Car	5825	VW Golf Racing (Rabbit) Competition Special																
1.12	Scale Radio Control Car	5828	Renault 5 Turbo Competition Special																
1.12	Scale Radio Control Car	5832	Toyota Racing Master Mk.3																
1.12	Scale Radio Control Car	5833	Ford C100 Racing Master Mk.4																
1.12	Scale Radio Control Car	5842	Porsche 956 Racing Master Mk.5																
1.18	Scale R/C Tank Series	5802	West German Leopard A4 Tank																
1.18	Scale R/C Tank Series	5803	West German Tigerpanzer Gepard																
1.18	Scale R/C Tank Series	5804	German King Tiger																
BATTERY AND CHARGERS		5802	Ni-Cd Battery 6V																
BATTERY AND CHARGERS		5804	Spooled Lead Acid Battery 6V																
BATTERY AND CHARGERS		5808	Ni-Cd Battery Quick Charger 6V																
BATTERY AND CHARGERS		5808	Ni-Cd Battery 7.2V																
BATTERY AND CHARGERS		5810	Ni-Cd Battery Quick Charger 7.2V																
BATTERY AND CHARGERS		5812	Ni-Cd 6V 4000mAh Battery																
BATTERY AND CHARGERS		5814	Ni-Cd Battery Quick Charger 6V 4000mAh																
BATTERY AND CHARGERS		5816	Ni-Cd Racing Pack 7.2V 1200mAh																
BATTERY AND CHARGERS		5816	Ni-Cd Mini Pack 6V 1500mAh																
MAINTENANCE MATERIAL & COLOR		6700	Tamaya Cement (40ml)																
MAINTENANCE MATERIAL & COLOR		6704	Tamaya Liquid Thread Lock																
MAINTENANCE MATERIAL & COLOR		6706	Tamaya Oil Spray																
MAINTENANCE MATERIAL & COLOR		6706	Tamaya Putty																
MAINTENANCE MATERIAL & COLOR		6708	Tamaya Finishing Abrasives (Medium Set)																
MAINTENANCE MATERIAL & COLOR		6710	Tamaya Finishing Abrasives (Fine Set)																
MAINTENANCE MATERIAL & COLOR		6711	Tamaya Cement Pan																
MAINTENANCE MATERIAL & COLOR		6712	Tamaya Cement (20ml)																
MAINTENANCE MATERIAL & COLOR		6713-6719	Tamaya Modeling Brushes																
MAINTENANCE MATERIAL & COLOR		6720	Tamaya Epoxy Putty																
MAINTENANCE MATERIAL & COLOR		6721	Tamaya Rubbing Polishing Compound																
MAINTENANCE MATERIAL & COLOR			Tamaya Acrylic Paint (88 colors + Primer + Flat Base)																
MAINTENANCE MATERIAL & COLOR			Tamaya Paint Marker (12 colors)																
MAINTENANCE MATERIAL & COLOR		8201-8212	Tamaya Color for Polycarbonate (12 colors)																

1.10 SCALE RADIO CONTROL CAR

- 5815 Rough Rider
- 5816 Sand Scooter
- 5818 Top 1/10 Mini 420R
- 5819 Williams FW-01 Competition Special
- 5820 J.P.S. Lotus 79 Competition Special
- 5823 Holzer Buggy
- 5824 Sand Rover
- 5827 Ford F-150 Ranger XL1
- 5828 Toyota 4-4 Pickup
- 5829 4-4 Blazing Blazer
- 5830 Honda F-2 Competition Special
- 5831 Brabham BT50 Competition Special
- 5834 Super Champ
- 5835 Vine Indy
- 5836 Audi Quattro Rally
- 5837 Opel Ascona 400 Rally
- 5838 Subaru Brat
- 5839 Willys Wheeler
- 5840 Lancia Rally
- 5841 The Frog
- 5843 The Grasshopper
- 5844 Mitsubishi Pajero

1.12 SCALE RADIO CONTROL CAR

- 5808 Lamborghini Countach LP500S Competition Special
- 5809 Cosco LB Turbo 50-5 Competition Special
- 5822 Datsun 280ZX Racing Master Mk.2
- 5825 VW Golf Racing (Rabbit) Competition Special
- 5828 Renault 5 Turbo Competition Special
- 5832 Toyota Racing Master Mk.3
- 5833 Ford C100 Racing Master Mk.4
- 5842 Porsche 956 Racing Master Mk.5

1.18 SCALE R/C TANK SERIES

- 5802 West German Leopard A4 Tank
- 5803 West German Tigerpanzer Gepard
- 5804 German King Tiger

BATTERY AND CHARGERS

- 5802 Ni-Cd Battery 6V
- 5804 Spooled Lead Acid Battery 6V
- 5808 Ni-Cd Battery Quick Charger 6V
- 5808 Ni-Cd Battery 7.2V
- 5810 Ni-Cd Battery Quick Charger 7.2V
- 5812 Ni-Cd 6V 4000mAh Battery
- 5814 Ni-Cd Battery Quick Charger 6V 4000mAh
- 5816 Ni-Cd Racing Pack 7.2V 1200mAh
- 5816 Ni-Cd Mini Pack 6V 1500mAh

MAINTENANCE MATERIAL & COLOR

- 6700 Tamaya Cement (40ml)
- 6704 Tamaya Liquid Thread Lock
- 6706 Tamaya Oil Spray
- 6706 Tamaya Putty
- 6708 Tamaya Finishing Abrasives (Medium Set)
- 6710 Tamaya Finishing Abrasives (Fine Set)
- 6711 Tamaya Cement Pan
- 6712 Tamaya Cement (20ml)
- 6713-6719 Tamaya Modeling Brushes
- 6720 Tamaya Epoxy Putty
- 6721 Tamaya Rubbing Polishing Compound
- Tamaya Acrylic Paint (88 colors + Primer + Flat Base)
- Tamaya Paint Marker (12 colors)
- 8201-8212 Tamaya Color for Polycarbonate (12 colors)

SOME IDEAS OF CAR DECORATION

Decorate your car, the fruit of your effort, as pretty as possible. Plastic bodies of the radio controlled electric model cars today are made so flexible that they can be displayed as stationary models.

From Tamiya, figures of the driver, mechanic, team manager and a tool set in 1:12 scale are already on the market. Arrange them around your car and you can make a nice lively decoration for display where your car certainly will look better.

1:12th SCALE MOTOR RACING TEAM SERIES

1 DRIVER

This is a doll of a driver in a racing suit with a helmet in his hand. The helmet is a full-face type, avisor is furnished as a separate part, a pair of gloves can be put into the helmet.

With Renault 5 Turbo



2 MECHANIC - WHEEL CHANGING

Tires play a vital role for a racing car. The tire manufacturers are struggling for better quality so intensely that it is called a "War of Tires". This is a figure of a mechanic holding a wheel wrench and unscrewing the nuts. A tire wrench, an air wrench, and a mechanic hammer are in the kit.

With Lotus LR Turbo



With Countach LP20



3 MECHANIC - ENGINE TUNING

A powerful racing car engine requires very delicate tuning up. This is a doll of a mechanic handling a plug wrench in his hand and checking plugs of the engine. The garment he wears is a mechanic's suit, called a coverall. A plug box and a plug wrench are included in the kit.



4 TOOL SET

Repair of the machine is done in the pit; also a piece of advice or two may be given to the driver. Many typical tools for racing cars are included from big devices as a jack and a welder to small tools which are supposed to function as fingertips of a mechanic. A set of three useful and helpful accessories.

With V6
Golf Racing



5 TEAM MANAGER

Taking the leadership of the team aiming at victory, the team manager is giving a piece of advice to the driver with one hand placed on the car body. He is in a sweater and wears a wristwatch, a sport cap on, the jacket consists of separate parts to create a feeling of reality.

ORIGINAL CAR BODY

In the real car world, there are many kinds of races: of formula cars, of 2 seater open racing cars, of remodeled machines from the cars on the market. It must be thoughtful to create model cars which cannot be obtained from the kits. These days many modelers are to be seen participating in races with their own car body or with remodeled cars from plastic model kits. It might be an exciting idea to run a classic car on the circuit. Some skillfulness at model building may be a must, but it is a challenging job.

1. USING PLASTIC MODEL BODIES

The most handy and simple way of creating your own body is to utilize car bodies of plastic models in the same scale. The scale allows reproducing the details; as a result, some portion of parts may be going to waste. And you have to figure it out previously whether or not there is enough space to install radio control units. When not, the chassis is sometimes transformed considerably. Also, the body may have to be reinforced sufficiently in case of collision.

2. MAKING BODIES OF YOUR OWN

Your bodies can be made based upon a real car or on your own design. In either case, extra decisively is called for. As for material, plastic plate and thin cardboard are often used.



3. MINOR CHANGE IN KIT BODIES

Only a little modification on a kit body may be needed for making an enjoyable car from a roofed car to an open type vehicle or an additional wing to the body or changing the front silhouette of a car.

•ADVICE FOR REMODELLING

You can remodel a car in any way you like for your own enjoyment. But if you have an intention of joining a race with it, it is recommended that your work will not be too different from real cars. Always keep in consideration to make it well balanced in function and in making up of each portion of a car. Some races will not allow cars to participate which are excessively remodeled.

TAMIYA COLOR ACRYLIC PAINT



TAMIYA ACRYLIC PAINTS

The new Tamiya paints are made from water-soluble acrylic resins and are safe, non-toxic, easy to use and will adhere an excellent finish to your prize models. These new paints come in 16 glossy colors, 45 matt colors and 12 transparent colors plus an exclusive thinner and flat base for producing a semi-gloss from the gloss colors. Each bottle contains 25ml and because of the excellent coverage, will last longer and be more economical than other paints.

USE ON ANY MATERIAL

The Tamiya Acrylic paints are excellent for painting wood, metal, home appliances, styrol resins, styro-foam and in fact just about any surface will accept acrylics. It retains its high gloss permanently, will not fade and once dry, can only be removed or marred with its own thinner. Since it is smooth, flowing, unswelling, bubbles are never a problem. Since it contains no lead, it is safe and completely non-toxic. Sprayed or brushed, Tamiya acrylics add the final touch to your modelling and artistic skills.

REQUIRES NO SPECIAL HANDLING

Cleanup after painting is no chore as plain water will cleanse all brushes and painting implements if done prior to drying. In the paint, already dried, the special acrylic thinner will dissolve the paint left on the brushes. The large heavy glass jar is stable and hard to tip over, and with the large mouth, large flat brushes can be utilized. As the bottle cap is moulded in the exact same color as the paint, location of that special color is almost a problem.

THINNER AND FLAT BASE

In addition to the 58 colors offered in the new Tamiya Acrylic Paints, a special thinner and flat base are available. The thinner is used for adjusting the thickness of the paint for brushing and spraying. When brush painting, add thinner a little at a time to achieve a moderate thickness that flows smoothly and evenly. For spray painting about 15% of thinner to paint is recommended. The flat base is an agent for making glossy paints any degree of dulness desired. For semi-gloss you would add about 15% flat base, and for a full base, add about 30% flat base. Be sure to mix well the added flat base.

2017 BEATRA & JENNALE 5 T. PICO 2000 RGT. 8000 L. 8000



BUCKLE RIDER 2100 RGT. 8000



SUPER CHAMP 2100 RGT. 8000



WILD WILLY 2100 RGT. 8000



11.4 BLAZING BLAZER 2100 RGT. 8000



PICK UP 2100 RGT. 8000



MATILDE 2100 RGT. 8000



MATILDE 2100 RGT. 8000



PICK UP 2100 RGT. 8000



WILD WILLY 2100 RGT. 8000



LEOPARD 44 2100 RGT. 8000



FLAMINGO 44 2100 RGT. 8000



TAMIYA RADIO CONTROL GUIDE BOOK



TAMIYA

TAMIYA PLASTIC MODEL CO.
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